12.3 Attaba-Azbakiah Transport Complex

12.3.1 Introduction

1) Background

A quick comparison between the Azbakiah garden and Attaba square area, when referring to a map prepared in 1948 and the same area at present, reveals the extent of transportation projects that have been developed there in the past four decades.

In the past, 26th July st. stopped at the garden's western border, but now extends the length of the garden through its middle. The Azhar st. flyover extends over Attaba sq. dividing into exit and entrance ramps that descend upon Opera sq.

Opera sq. once housed the Opera House which was destroyed by a fire. The square was then utilized for some time as a surface parking area, and in 1986 a multi-story garage was opened in the square along with the Attaba multi-story garage which was built on the tip of the garden on its eastern border. Even with the presence of these two garages (total capacity 1850 vehicles) and two new garages under construction nearby along Boustan and Gomhouria streets, still much more parking space is required for the CBD area, as described in section 12.2 of this chapter.

Two mini bus terminals and one terminal each for buses and micro buses are also located under and near the two multi-story garages.

In general, development of the area seems to have been haphazard with much encroachment upon the garden. In addition to the multi-story garage built on the garden grounds, a second theater, various police facilities, a telephone exchange building, a mosque and cafeterias have sprouted up on the garden's grounds during the past forty years. The present area of the garden is 4.5 hectares.

Bearing in mind that Azbakiah garden is the only large green area within the city center area, and that there has been in recent years rapid and somewhat unorganized development, in addition to the needs of the transportation and traffic in this vital location, it becomes evident that a careful development plan incorporating all these considerations must be drawn up and implemented in the future.

2) Purpose

The ultimate aim of the project is to redevelop the Azbakiah Park/Attaba area in a comprehensive manner, with the objectives of:

a. Prevention of haphazard invasion of urban facilities and reform the park into one of the GCR symbolic areas.
b. Improvement of traffic congestion at Attaba sq.

c. Provision of off-street parking facilities.
d. Coordination of public transportation.

3) Location

To attain the aforementioned purpose, the project should cover not only Azbakiah Park but also Attaba sq. and their vicinities. Present land use of this area is shown in Fig. 12.3.1 and Fig. 12.3.2 shows the heights of the surrounding buildings.

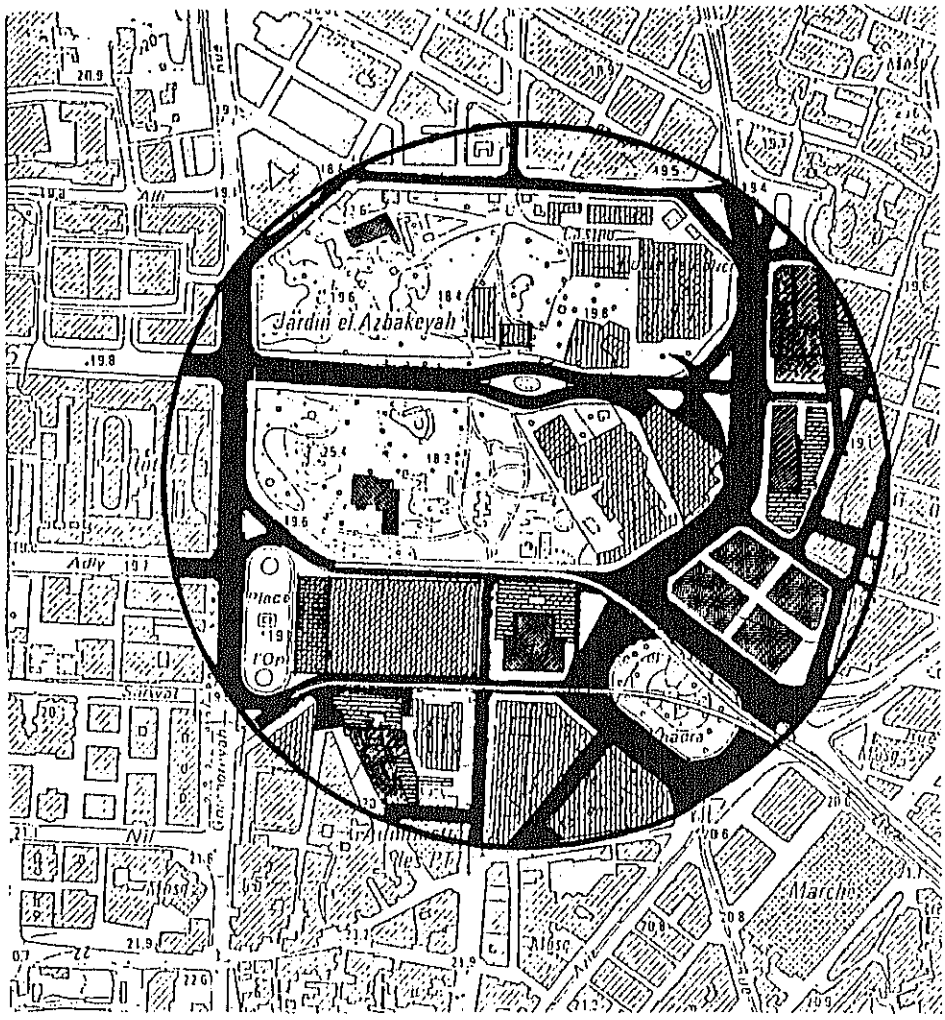


Fig. 12.3.1 Azbakiah and Attaba Area

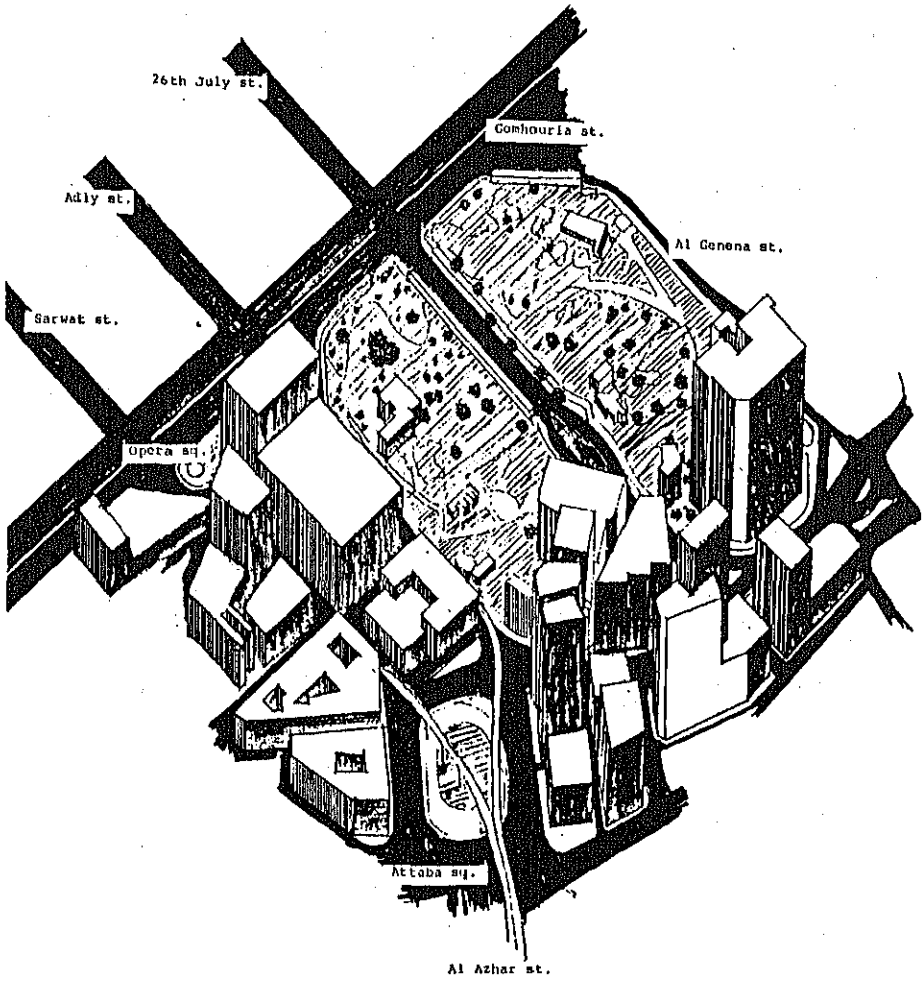


Fig. 12.3.2 Existing Buildings in Azbakiah and Attaba Area

12.3.2 Plan Outline

The subject plan has been developed taking into account the inter-relationship between the subject plan, the CBD Traffic Circulation Plan and the Urban Redevelopment Plan shown in following section, 12.4. The plan outline is described below.

1) Land Use

The present land use was considered from the point of view of possibility of removal of existing buildings in the area suggested for the Attaba-Azbakiah transport project plan.

It will be required to remove a total of 20 buildings, as shown in the Fig. 12.3.3, and Table 12.3.1. In addition, approximately 400 street vendors are located around the garden, some shops as kiosks and others just having wooden tables. Such street vending activity will also have to be removed.

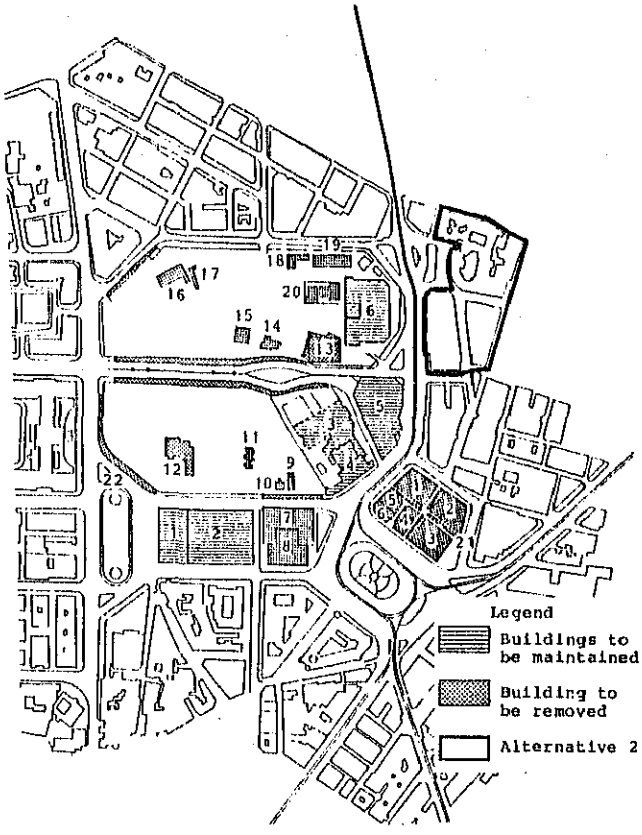


Fig. 12.3.3 Locations of Buildings to be Removed

Table 12.3.1 Buildings to be Removed

No.	No. of Floors	Activity by Percent (%) Reside-ntial	Comme-rcial	Institu-tional	Manuf-acture	Services	Remarks
1	4	-	25	-	50	25	
2	6	-	14	-	86	-	Mostly shoes and clothes workshops
3	3	-	30	-	70	-	Mostly shoes workshops and tailors
4	12	23	8	-	-	69	Residences, hotel and offices
5	11	-	8	-	-	92	Offices and hotel
6	11	-	7	-	-	93	Offices and hotel
7	3	66	31	-	-	3	Building partially destroyed, commercial activity on ground floor
8	2	-	33	67	-	-	
9	1	-	-	100	-	-	Governmental building
10	1	-	-	100	-	-	Governmental building
11	1	-	-	100	-	-	Monument
12	2	-	-	-	-	100	Egyptian Fencing Association
13	3	-	-	100	-	-	Mosque and clinic
14	2	-	-	100	-	-	Cairo Traffic Police
15	2	-	100	-	-	-	Co-op shop
16	1	-	100	-	-	-	Restaurant
17	1	-	100	-	-	-	Restaurant
18	3	-	-	100	-	-	Police station
19	3	-	-	100	-	-	Police station
20	3	-	-	100	-	-	Police station
21	1	-	100	-	-	-	Small shops, mostly watches
22	1	-	100	-	-	-	Small vendors; mainly books and electric goods

Most of the buildings in the garden are governmental and their removal will not create social or economic problems. Building numbers 4, 5 and 6 are the only modern tall buildings in the area under study and protest shall probably be made against their removal. It is conceivable that the activities in buildings 1 to 6 could be reinstated in the new plan for that block.

As seen in Fig. 12.3.3 there are 6 existing buildings that will be integrated in the new plan. These buildings are shown in Table 12.3.2.

Table 12.3.2 Buildings to be Maintained

No.	No. of Floors	Activity by Percent (%) Commercial	Institutional	Services	Remarks
1	9	2	98	-	Governorate Office Bldg, with Commercial and Office Space for Rent
2	6	-	100	-	Multi-Story Public garage
3	6	100	-	-	Theater
4	4	100	-	-	Theater
5	6	-	100	-	Multi-Story Public garage
6	12	-	100	-	Governmental Building (PTT)

The area east of the PTT building (Alternative 2 in Fig. 12.3.3) consists of 12 buildings with an average height of 2.5 floors. All the buildings are old, with the exception of one building, and the removal of these buildings may not face as much problems as in the case of buildings 1 to 6.

2) Roads and Terminals

(1) Roads Network

In accordance with the Network of CBD Traffic Circulation Plan and the Urban Redevelopment Plan in CORPS, the road function on the subject plan is shown in Fig. 12.3.4. 26th July, Azhar, Gueish and Aziz streets are arterials. A direct linkage between 26th July st. and Gueish st. should be considered. A section of Gomhouria st. and Attaba sq. on Adly st. will serve as the Exclusive Bus route/pedestrian street. Clot Bey st. will be improved as an arterial in future urban redevelopment plan. In order to obtain the route of the on/off ramps for an elevated street, a channelization with traffic regulation in Opera sq. will be considered.

(2) Public Transport Network

There are four types of future public transport as discussed in Chapters 11 and 12. They should be coordinated at an Inter-Model point. The Urban Metro lines No. 1 and No. 2 will cross at the intersection of 26th July and Gomhouria streets. Two types of bus terminals (CBD bus, CTA bus) should be constructed near

Attaba sq., and only the existing tramways on Gueish st. and Qalaa st. will remain. The coordination of public transport is shown in Fig. 12.3.5.

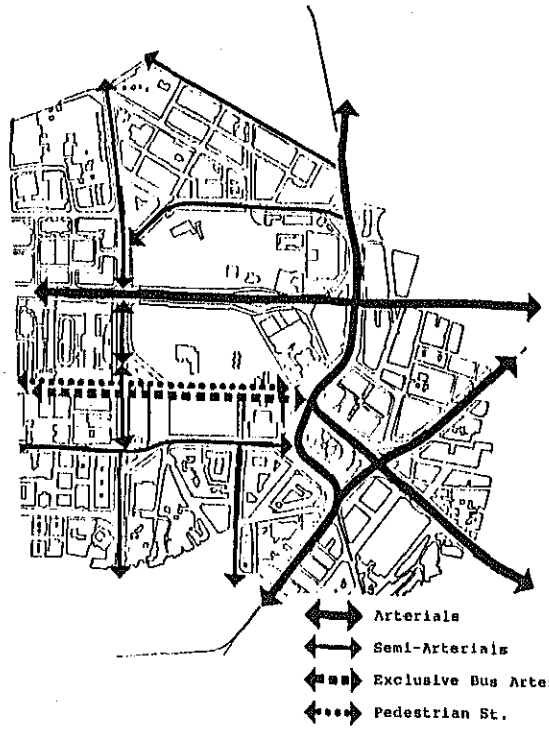


Fig. 12.3.4 Road Function on Subject Plan

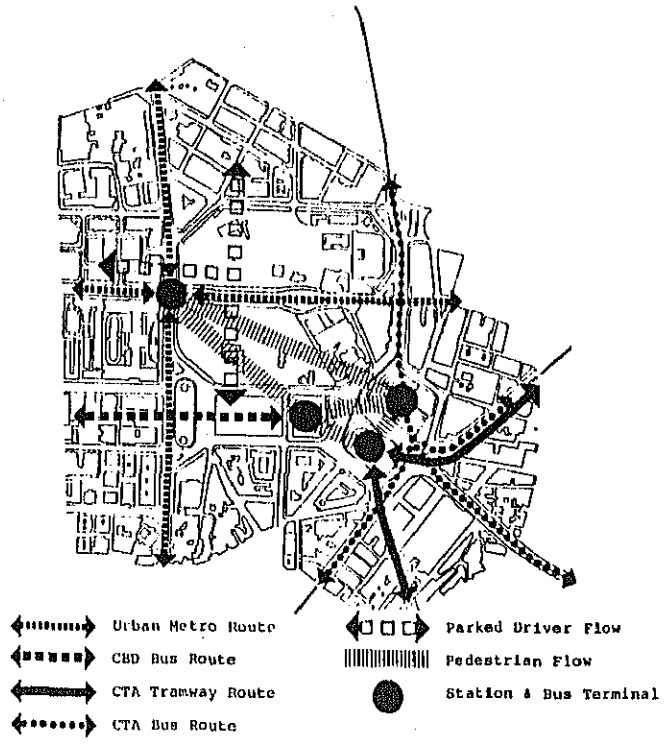


Fig. 12.3.5 Coordination of Public Transport

The outline of CBD bus terminal is shown in Fig. 12.3.6. It will also serve as a CTA mini-bus terminal. The required number of berths for CBD bus will be 5. Fig. 12.3.7 indicates CTA bus terminal, while another plan for an alternative site is shown in Fig. 12.3.8. In accordance with future bus estimation, the required number of berths will be 16.

(3) Park and Commercial Area Plan

As described in this chapter, the Azbakiah garden represents the only green area in the CORPS, and the preservation and beautification of this area is the main consideration of this plan.

The conceptual plan presented here is shown in Figures 12.3.9, 12.3.10, and 12.3.11. The plan shall feature the following:

a) Underground garage
b) Commercial area
c) Elevated park
d) Cafeteria and open theater
e) Upgrading of part of existing garden

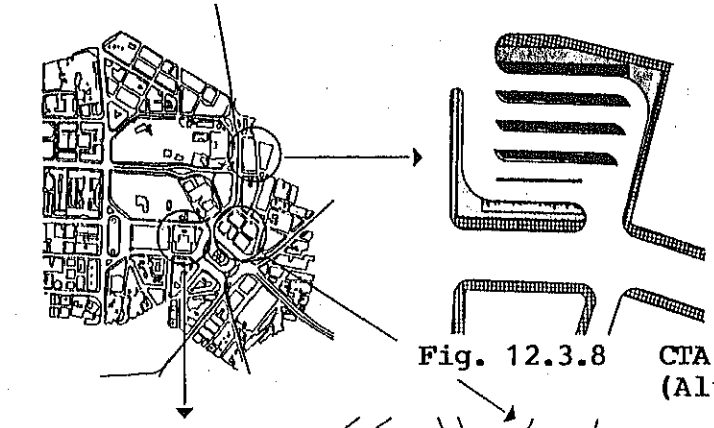


Fig. 12.3.8 CTA Bus Terminal (Alternative B)

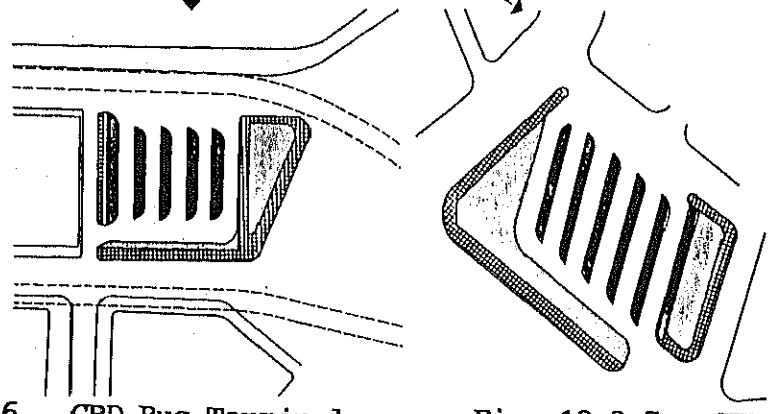


Fig. 12.3.6 CBD Bus Terminal

Fig. 12.3.7 CTA Bus Terminal (Alternative A)

This plan introduces an underground garage, with a commercial area above it with about half its height below the ground level and an area of roughly 3.8 hectares. Four large recesses and a number of smaller ones at levels slightly higher than the commercial area floor level will provide lightening and ventilation for the commercial areas. Vegetation and fountains shall be placed in the four large recesses with no available access.

The elevated park will be located above the commercial floor. A sufficient thickness of soil shall be laid in order to grow plants, grass and small trees. The park ground level will be about 2.0 m above the ground level at the edges but will gradually slope upwards towards the park center so that there shall be sufficient clearance between the park bottom slab and the 26th July st. The elevated park shall be of such elevation that pedestrians walking along the streets beside the park may have a view of the park's greenery. There will be a network of pathways within the park and slight level separations with steps. Benches will be provided along the pathways and people will be discouraged from walking or playing on the grass. At the north-western corner of the elevated park a cafeteria is suggested, with a small open theater located in the south-western corner.

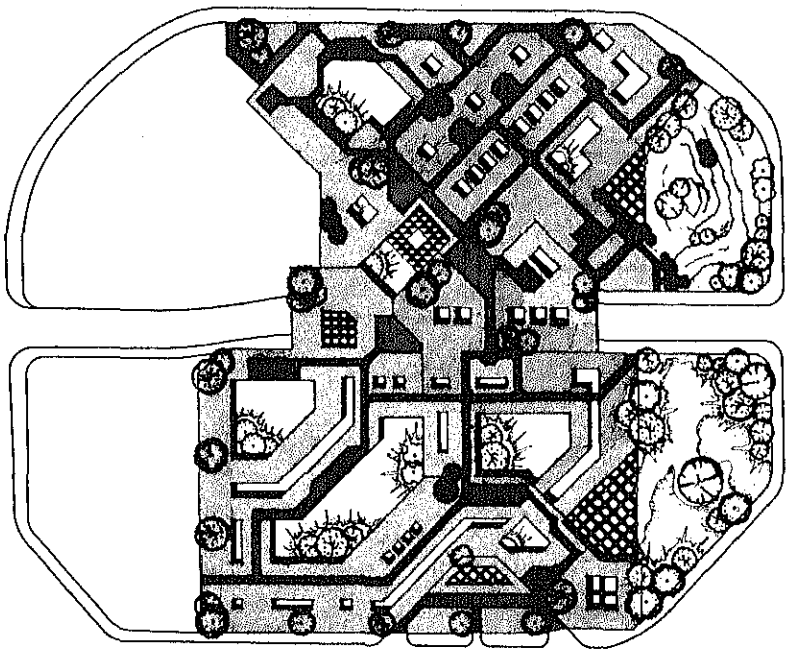


Fig. 12.3.9 Elevated Park Plan

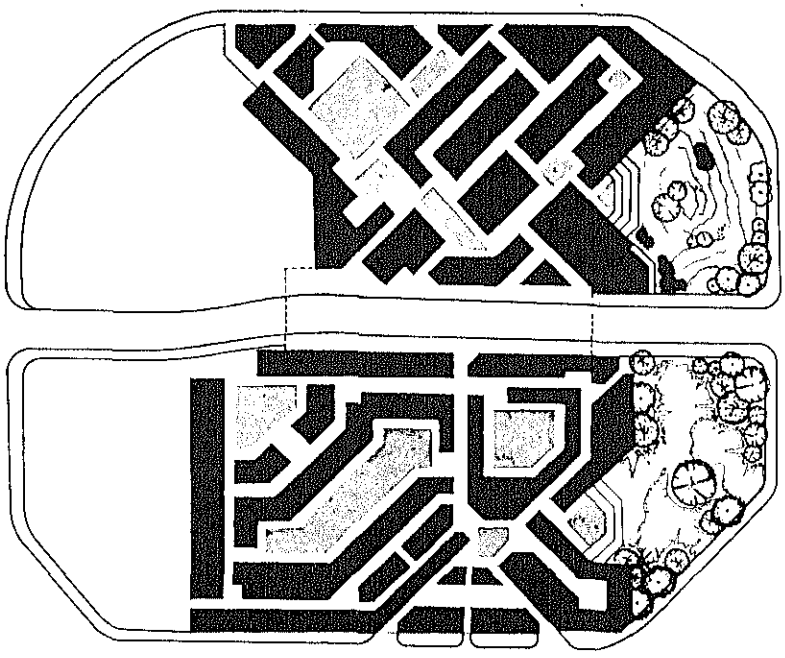


Fig. 12.3.10 Commercial Area Plan

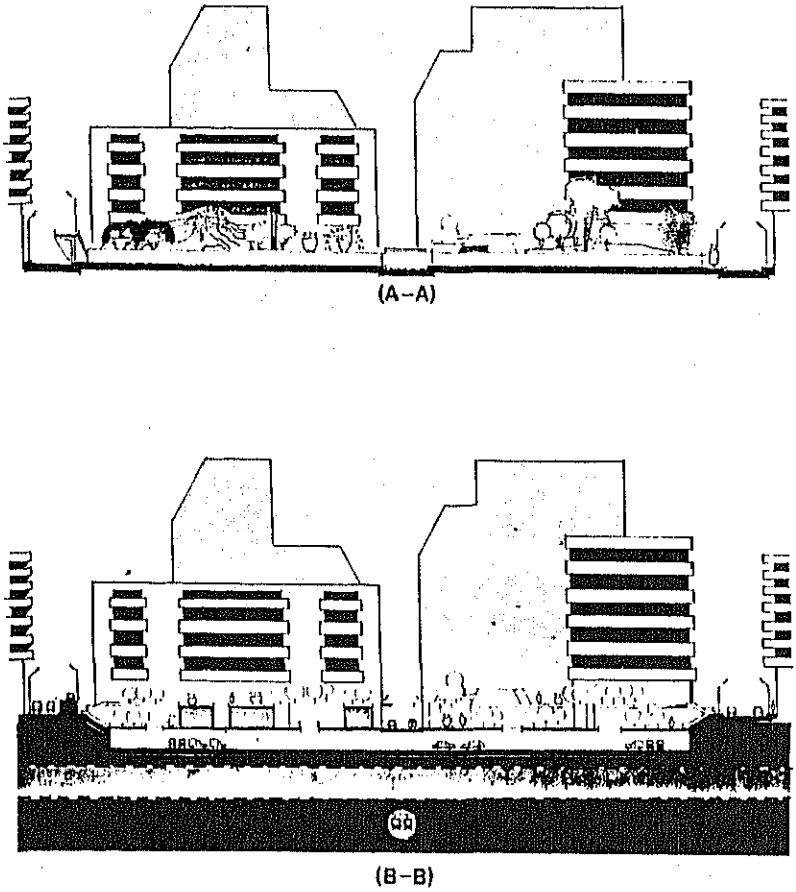


Fig. 12.3.11 Cross Sections of Azbakiah Park and Commercial Area

Vendors shall not be allowed to pursue their activities on the elevated park grounds, and shall be restricted to the commercial area.

The original park grounds shall be maintained from Gomhouria st. and up to the elevated park's western border. At present, old tall trees and a small hill exist in that section and it is suggested that they be kept, but with the necessary upgrading of the green area there. Paths with steps shall be made available at certain points to connect the elevated park and to original preserved park section.

(4) Underground Garage

In the eastern half of the park, construction of underground garage is recommendable to mitigate the serious parking shortage in CBD. This garage should be designed to have an underground corridor to the future subway station. This linkage would promote park-and-ride habits of car users. The parking capacity is estimated to be about 1600 pcu.lots according to an area of 4.2 ha. The underground garage plan is shown in Fig. 12.3.12.

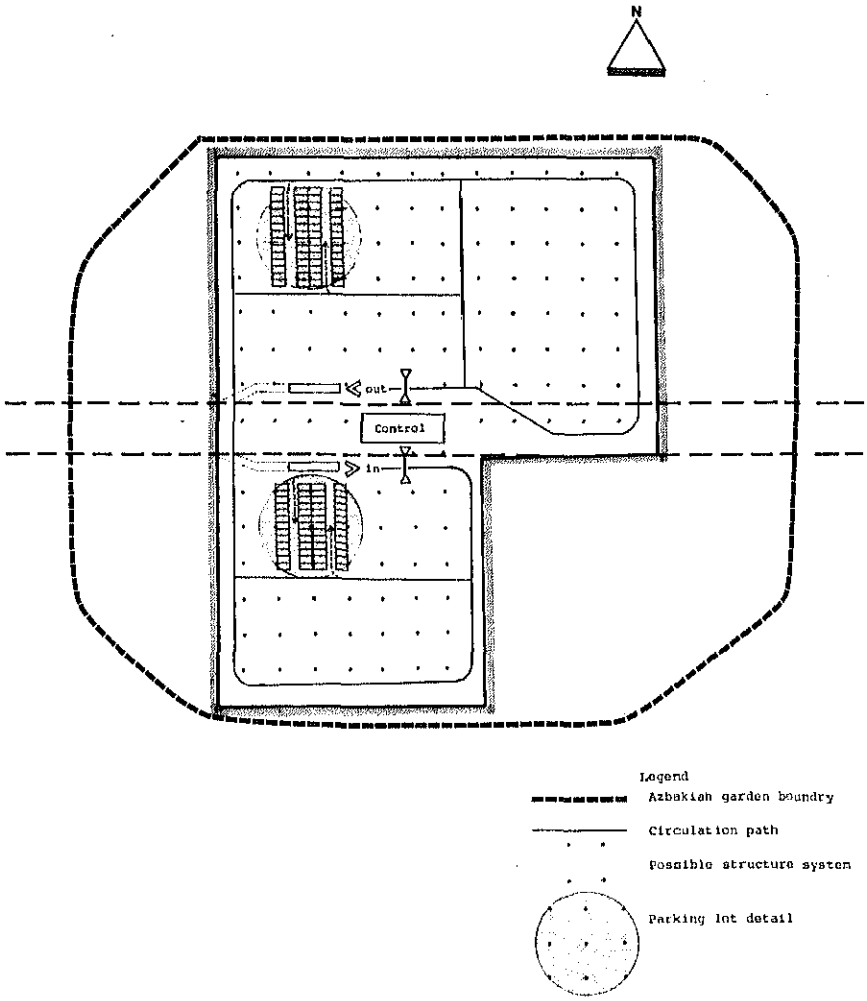


Fig. 12.3.12 Underground Garage Plan

The development plan should be prepared carefully considering various factors. A development image is shown, as an example, in Fig. 12.3.13.

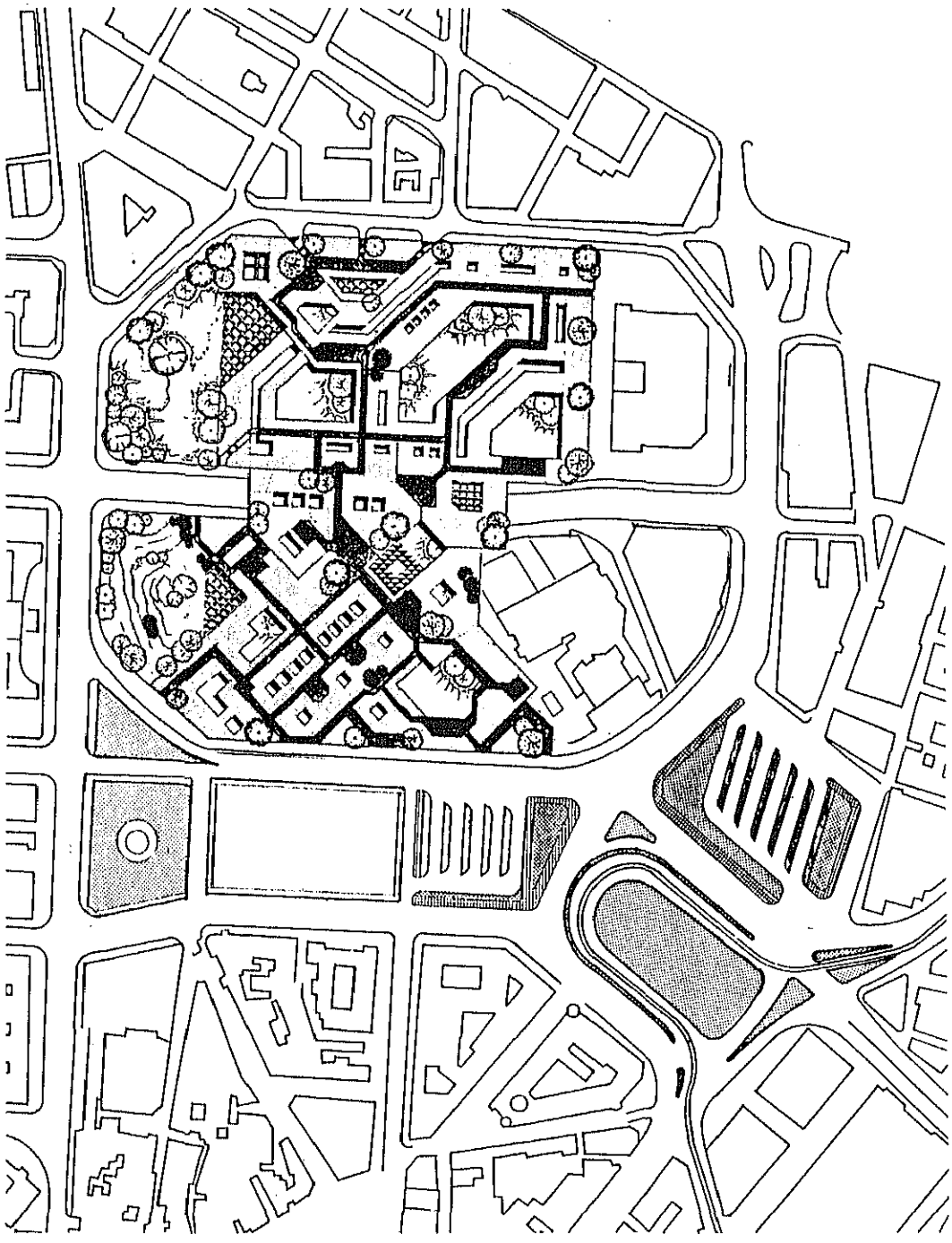


Fig. 12.3.13 Development Image of Azbakiah Park Commercial Area Plan

12.4 Urban Redevelopment Plan in CORPS

12.4.1 Introduction

1) CORPS Area

Based on the existing conditions, it is suggested that out of a total CORPS area of 8.06 km2, an area of approximately 2.2 km2 (28% of total area) should be redeveloped. Fig. 12.4.1 shows the areas within CORPS where development is suggested.

The total population of CORPS in 1987 was estimated to be 320,000 persons and the population of Areas 1, 2, and 3 was 140,400 persons which is 44% of the total CORPS population.

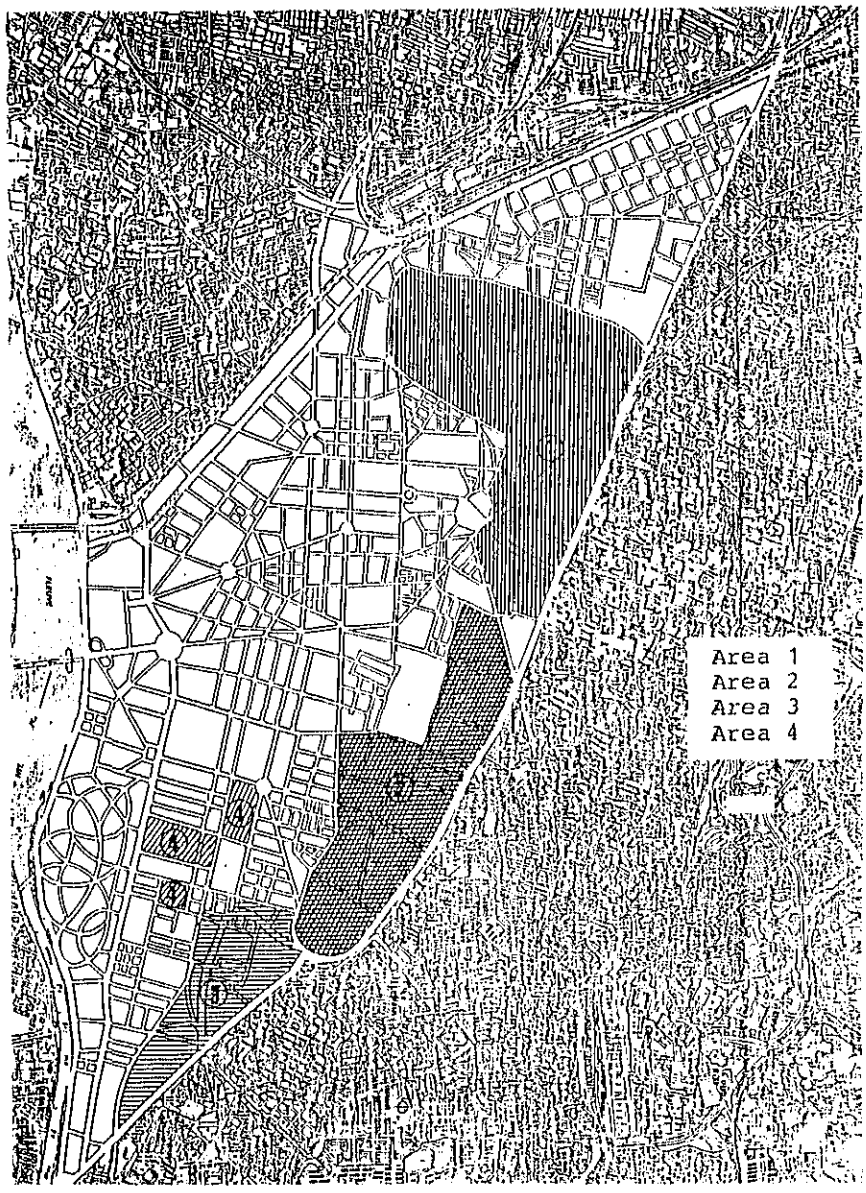


Fig. 12.4.1 Areas Within CORPS Suggested for Redevelopment

2) Necessity for Redevelopment

Areas 1, 2, & 3 may be characterized by their haphazard development, winding narrow alleys, dilapidated buildings, poor road conditions, and unsanitary environment.

The conditions in these areas match the criteria set out in the Execution Regulations no. 600/1982 issued by the Ministry of Housing and Reconstruction regulating urban planning and redevelopment. Table 12.4.1 identifies a number of these criteria which correspond to the existing conditions in the areas in question.

Table 12.4.1 Criteria for Evaluating Redevelopment Need

Items	Area 1	2	3
1 High population density	0	0	0
2 Workshops occupy large area causing environmental problems	0	-	-
3 Streets narrow and winding and accessibility difficult	0	0	0
4 Area not served by public transport	0	0	0
5 Difference in land levels	-	0	0
6 Poor or no street pavement and pedestrian paths	0	0	0
7 Poor cleanliness measures	00	0	0
8 Lack of adequate recreational facilities such as playgrounds and green spaces	0	0	0
9 Poor ventilation and lightening in dwelling units	0	0	0
10 Poor building conditions	00	0	0
11 Presence of wholesale markets	00	0	0

In view of the:
- negative influence such areas have on the city center, which they border,
- poor living and working environment, and
- high development potential due to proximity to CBD,

it is deemed necessary that such areas be redeveloped.

12.4.2 Site Selection

1) Characteristics of each Area

A detailed land use survey was conducted in 1987 for CORPS, the results of which are shown in Chapter 1. From the data collected during that survey the following Table 12.4.2 was prepared.

2) Description of Area 1

Workshops, wholesalers and retailers are grouped together in sections by activity as shown in Fig. 12.4.2 and Table 12.4.3. Commercial activity is dominant in the southern section, while the northern section of the area is mainly residential with commercial activity once more found along Kamel Sidky st. Commer-

Table 12.4.2 Characteristics of each Area

Items	Area 1	Area 2	Area 3
Land Area (ha)	106.0	66.0	34.0
Floor Area (ha)	203.0	139.0	56.0
Built Up Area (ha)	68.0	42.0	18.0
Land Use (% of total floor area)			
Residential	66.0	72.5	70.2
Commercial & Services	15.2	8.4	15.6
Institutional	2.2	5.4	4.4
Education	1.0	4.7	1.1
Workshops & Wholesalers	9.2	3.4	4.8
Population (x1000)	70.0	50.4	20.0
Population Density (persons/ha)	660.0	764.0	588.0
Residential Density (m2/person)	20.0	20.0	20.0
Percent Built-Area to Land Area (%)	64.3	63.3	52.3

cial activity there mainly comprises printing shops and plumbing fittings shops. Commercial activities in the area are basically located on the ground floor with the upper floors used for residential purposes.

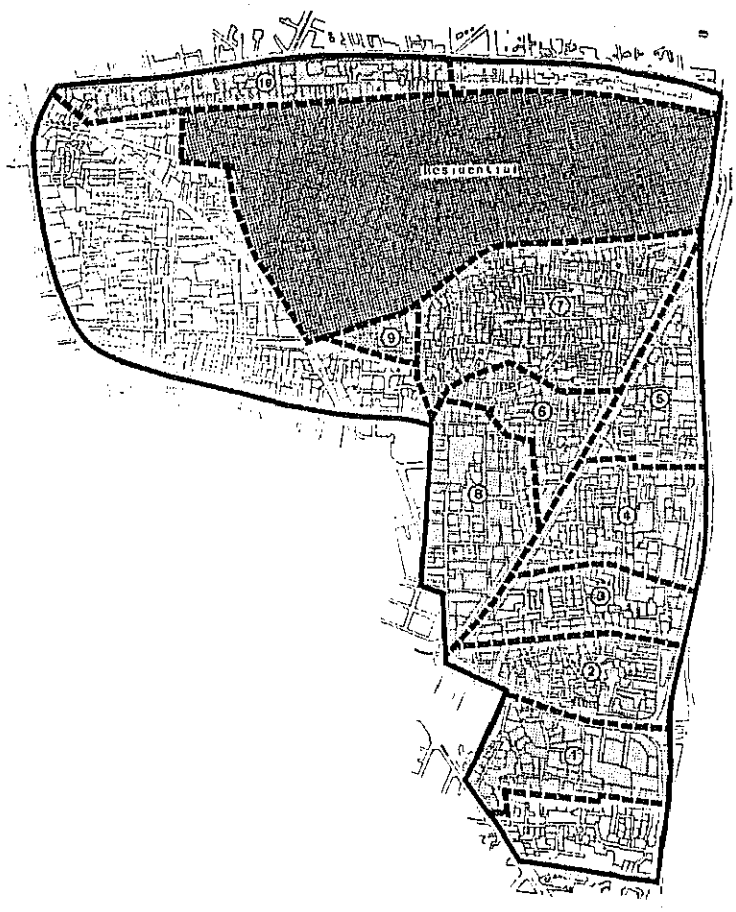


Fig. 12.4.2 Area 1: Residential and Commercial Land Use

Table 12.4.3 Activities by Section in Area 1

Section	Main Activities (w/s, wholesalers, & shops)
1	Wood carpentry w/s, paints wholesalers, metal w/s, electric products repair w/s.
2	Leather goods w/s and wholesalers, kitchen metallic utensils w/s, children's clothes, shoes, and electric light fixtures shops.
3	Electric light fixtures wholesalers, metallic w/s, Cardboard boxes w/s & wholesalers, wedding parties goods w/s & wholesalers, and paper shops.
4	Printing shops, metallic w/s, paper shops, and electric light fixtures shops.
5	Leather goods w/s, metallic w/s, and foods products storehouses.
6	Metallic w/s, paper shops, and leather goods shops.
7	Shoes w/s & shops, and wood products shops.
8	Furniture w/s, shops for house appliances, clothes, paints, and metallic goods.
9	Shops selling empty glass bottles.
10	Print shops, and plumbing fitting shops.

Most of the buildings are structurally unsafe with many already placed under demolition orders, however people continue to live and work in them. While the average building heights are 3 floors, some tall buildings exist. Fig. 12.4.3 shows the conditions of buildings and building heights in Area 1.

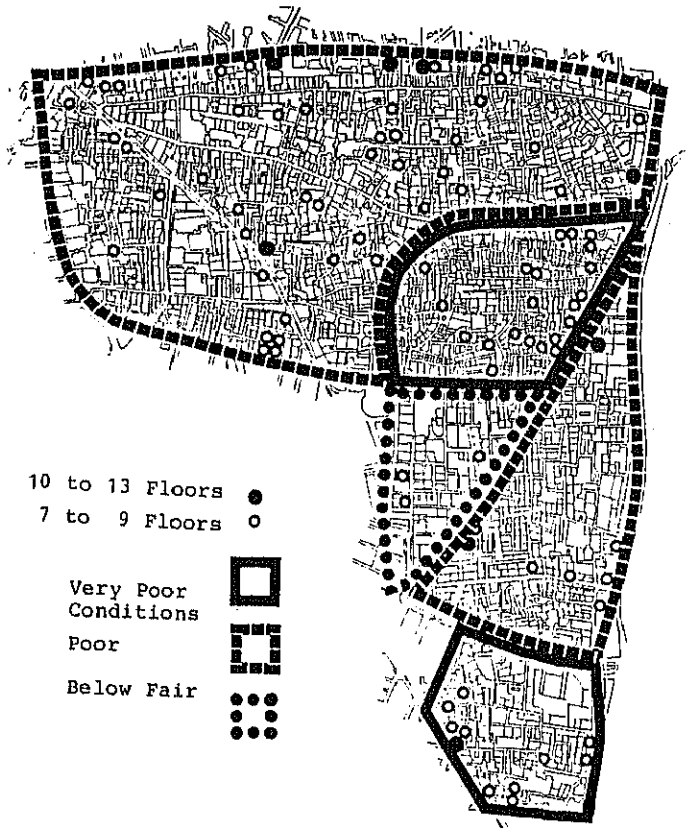


Fig. 12.4.3 Area 1: Building Conditions and Heights

Land value in the northern half is about 400 LE/m2 while in the southern half it is twice that much, and reaches 1000 LE/m2 along the main streets.

Street pavement and sanitary conditions are very bad. The street network is mainly composed of alleys, narrow and winding with sudden dead-ends. Such conditions make movement within the area very difficult.

Along Kamel Sidky st. some parts of the old Cairo wall still remain, but are enclosed by buildings from all sides.

3) Description of Area 2

This area is mainly low-income housing in poor condition. However building conditions are better than of those buildings in Area 1. The buildings in the northern half, behind Abdin Palace are in fair condition, while buildings in the southern half are slightly worse. However, compared to the other two areas, the rate of construction of new buildings in Area 2 is the highest and there are some buildings more than 14 stories. Fig. 12.4.4 shows the building conditions and building heights in Area 2.

Although the roads are unpaved, yet the sanitation conditions do not appear to be as bad as compared to that of Area 1. Schools and historic mosques are found in the southern half.

4) Description of Area 3

Building conditions are very poor throughout most of Area 3, and tall buildings are few in number, with no buildings more than 9 floors, as shown in Fig. 12.4.5. To the north of Dr. Ali Ibrahim br. most of the buildings in the area surrounded by the metro tracks and Khalig Al Masri st. have been placed under demolition orders.

There is a difference in ground levels in the area's southern part. Streets and alleys within the area are all very narrow and there are many dead-end streets. Vehicle movement is scarce and sanitary conditions are poor, especially in the southern section.

The section east of the new Sayedah Zeinab Regional Metro sta. has been developed as a large parking space for park-and-ride passengers, but accessibility to it is poor.

5) Description of Area 4

Recently many opinions have been expressed among officials and planners calling for the removal of governmental buildings found in the southern section of CORPS to new cities such as 6th October and Sadat. To date, however, nothing has been done. A realistic approach may be to start with clearing the old low buildings. During the CORPS land use survey all such buildings

Fig. 12.4.4 Area 2: Building Conditions and Heights

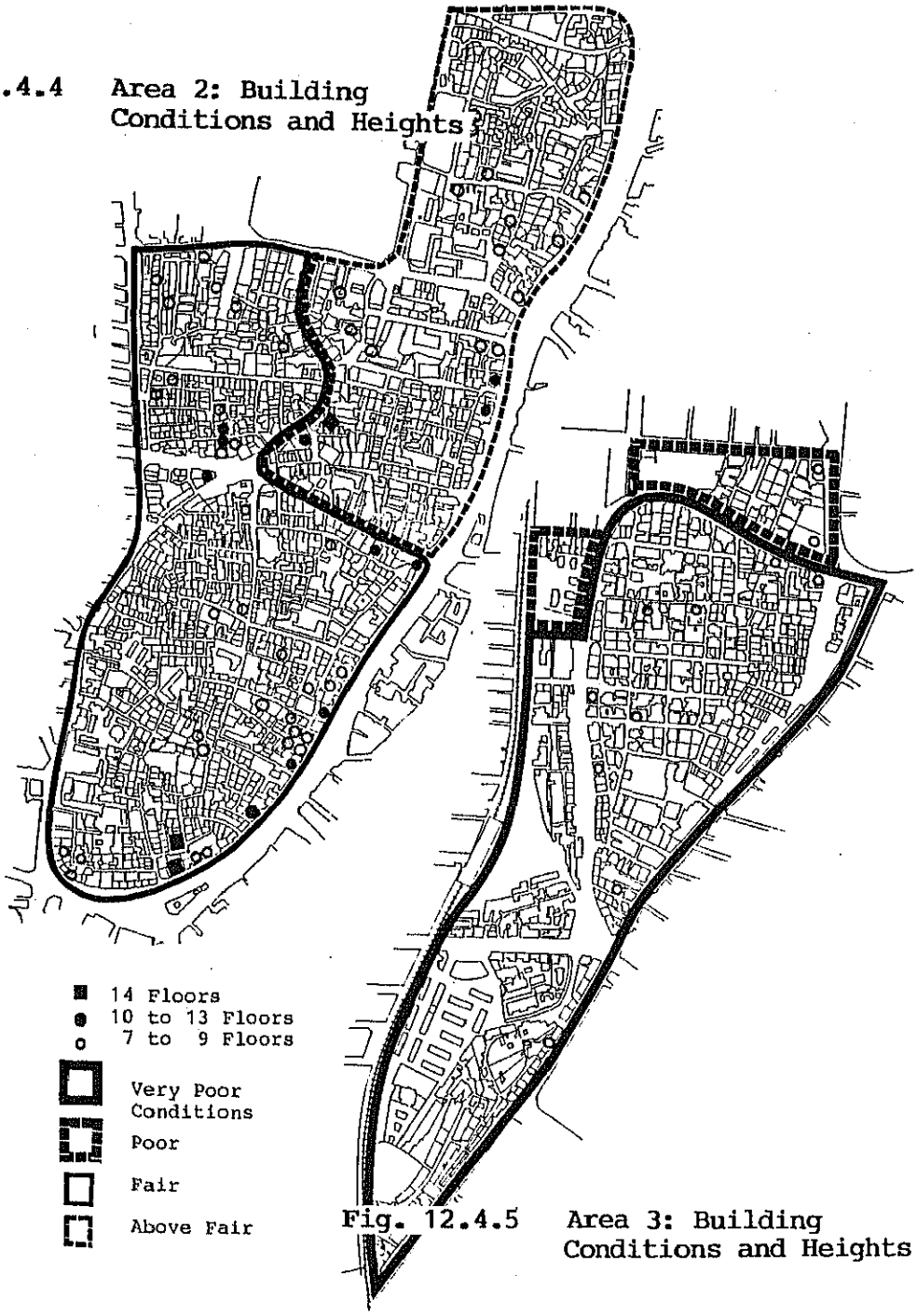


Fig. 12.4.5 Area 3: Building Conditions and Heights

were checked as to elevation. Blocks having buildings of 1 to 4 stories were chosen as suitable locations for renewal plans. Two such blocks are shown in Fig. 12.4.1, while the lower third block is already an open space.

One of the suitable plans for these three blocks would be to create green spaces and cultural or educational centers in adjacent existing tall buildings.

6) Other Potential Areas

Most of the buildings located between Galaa and Ramses streets, south of 26th July st. are 2 to 3 story old governmental buildings which may be cleared to make way for future development projects such as parking space to serve the CBD area.

12.4.3 Urban Redevelopment Method

1) Applications in Cairo

(1) Gamalia Area, Cairo

A study was prepared a few years ago for upgrading the Gamalia area, on an area of about 340 ha, with a population of about 300,000 (Fig. 12.4.6 (a)).

The basic strategy of the study called for the removal from the area activities that are causing harm, and secondly the upgrading of buildings.

Concerning building conditions the study recommended that 65% of all buildings, with the exclusion of those having a historical value and which are in poor conditions, should be torn down and replaced.

The study called for the establishment of an authority to be responsible for the upgrading project. Such an authority would have powers to appropriate properties and compensate owners, and raise land values.

An action plan was prepared for a pilot area of 14.3 hectares, within the study area. The financing of the action plan was to come from investments and governmental allocations. Governmental allocations were to be spent on the restoration and repair of buildings of historic value.

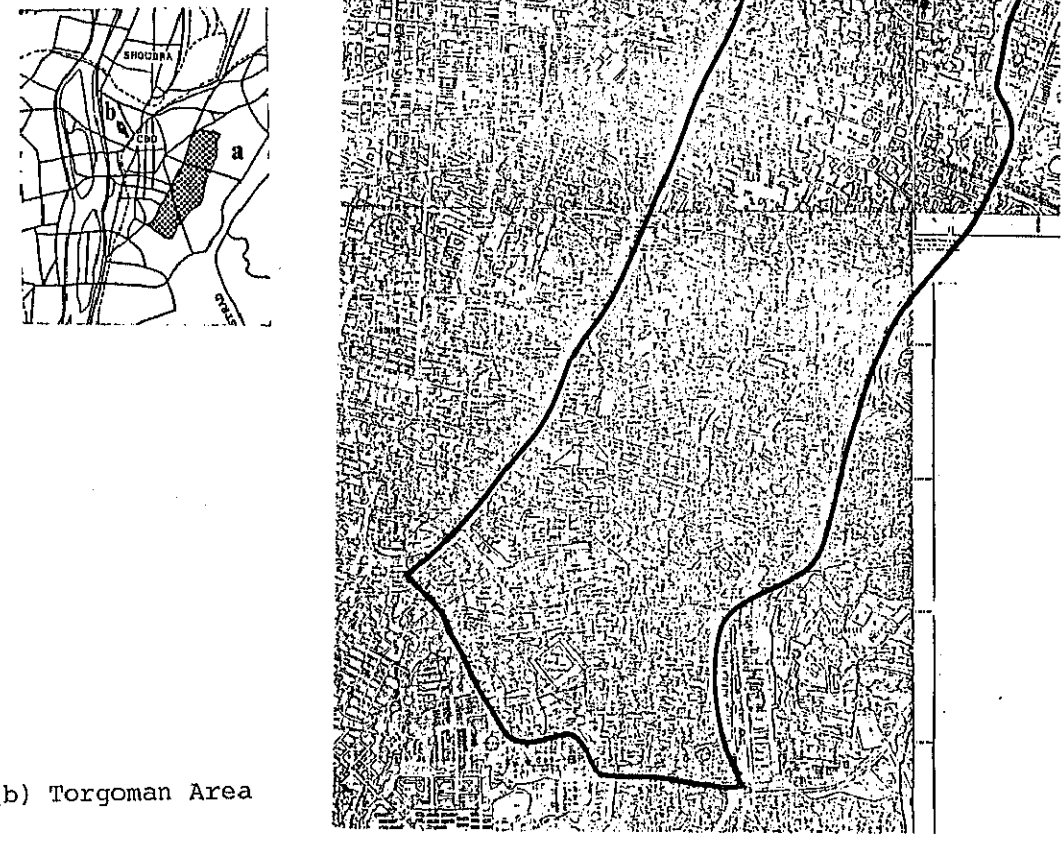
The implementation of this study has not yet started.

(2) Torgoman Area

Cairo Governorate and a number of public companies have begun the execution of a development plan for the Torgoman area (10.2 ha), as shown in Fig. 12.4.6 (b).

The development plan involves the total clearance of the existing buildings, most of which have an average of 3 to 4 stories and are in poor condition. They will be replaced by modern commercial and office buildings in this location which borders the CBD.

In accordance with Law 577/1954 governing land appropriation, property owners were compensated financially and tenants were reallocated to another area, and a large part of the Torgo-



(b) Torgoman Area

(a) Gamalia Area

Fig. 12.4.6 Upgrading Applications in Cairo

man area was cleared. This cleared area is at present being used temporarily for parking. The costs of land appropriation were borne by the governorate and the public companies concerned.

The project is now temporarily suspended, postponing further demolition and the selling of plots for development; this is due to some policy and zoning issues that are being resolved at present.

2) Applications in Japan

Fig. 12.4.7 shows the outline of the project flow and the Right-Conversion System applied to compensate for land acquisition in urban redevelopment projects in Japan. In brief, such projects proceed as follows:

(1) Right-Conversion System

The project applies the Right-Conversion method in exchange for land acquisition. Previous rights on land and/or buildings are to be converted to certain floors of renewed buildings. In this way rightful persons are not necessarily forced to move out and discontinue their living or business activity.

(2) Sale of reserved floors to meet project cost

A part of the buildings in the project is given to the rightful persons. Excess floors are reserved to be sold to meet the project expenses.

(3) Participation of private sector

The executors of the project are not only public bodies such as local municipalities and the housing/urban development corporation but also as a union of the rightful persons. The private developers are allowed to participate in the project as union members.

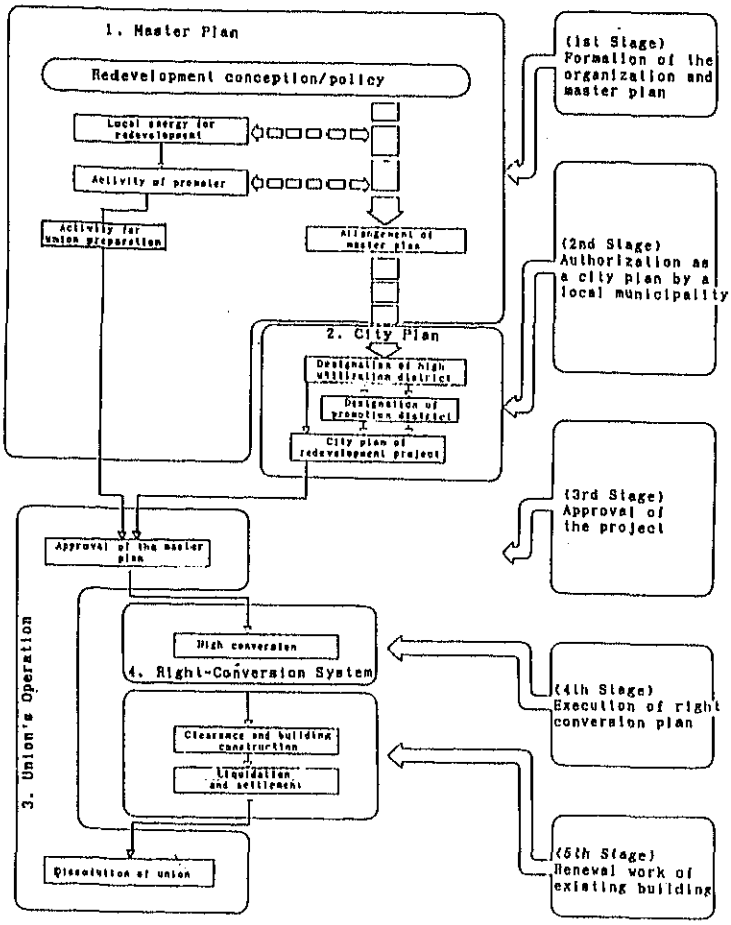
12.4.4 Case Study for Area 1 Redevelopment Plan

1) Choice of Area 1

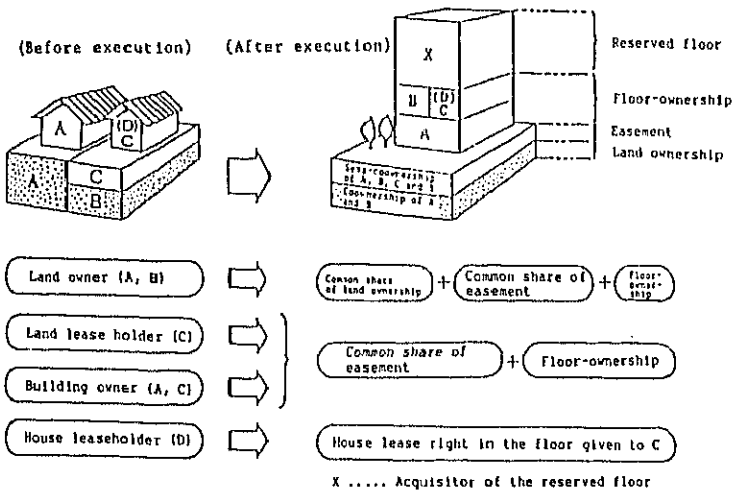
In this chapter a basic redevelopment plan will be prepared for Area 1, described in section 12.4.2. The redevelopment of Area 1 provides the opportunity to realize important arteries and roads such as widening and upgrading of Kamel Sidky, Gomhouria, Azhar, and Gueish streets and extension of 26th July st. Parking facilities such as multi-story garages may be constructed in the redeveloped area. In addition, more space will be made available for commercial and service activities to expand along the CBD.

Furthermore, of the three areas within CORPS where redevelopment is necessary, Area 1 has the worst environmental and living conditions. The haphazard and continued uncontrolled increase of workshops and warehouses has lead to very poor living and working environments.

Finally it is feared that should conditions continue unchanged, new buildings will be constructed in the place of collapsed buildings and in open spaces in such an unplanned manner, making it more difficult to implement future redevelopment plans. Such a trend has been observed in Area 2 where new buildings have been constructed in the absence of a clear plan for new roads or improvement of living conditions.



(a) Outline of Project Flow



(b) Flow of Right-Conversion System

Source: Textbook for Urban Development, JICA

Fig. 12.4.7 Urban Redevelopment Scheme Applied in Japan

2) Road Network in Area 1 Redevelopment Plan

The suggested road network for Area 1 after redevelopment consists of widening and some extension of the following arterials:

-	Kamel Sidky st.	ROW 40 m	widening
-	Gomhouria st.	ROW 30 m	widening
-	Nagib Al Rihani st.	ROW 20 m	widening & extension
-	26th July st.	ROW 20 m	extension
-	Azhar st.	ROW 30 m	widening
-	Qalaa st.	ROW 20 m	widening
-	Gueish st.	ROW 30 m	widening
-	Port Said st.	ROW 32 m	widening

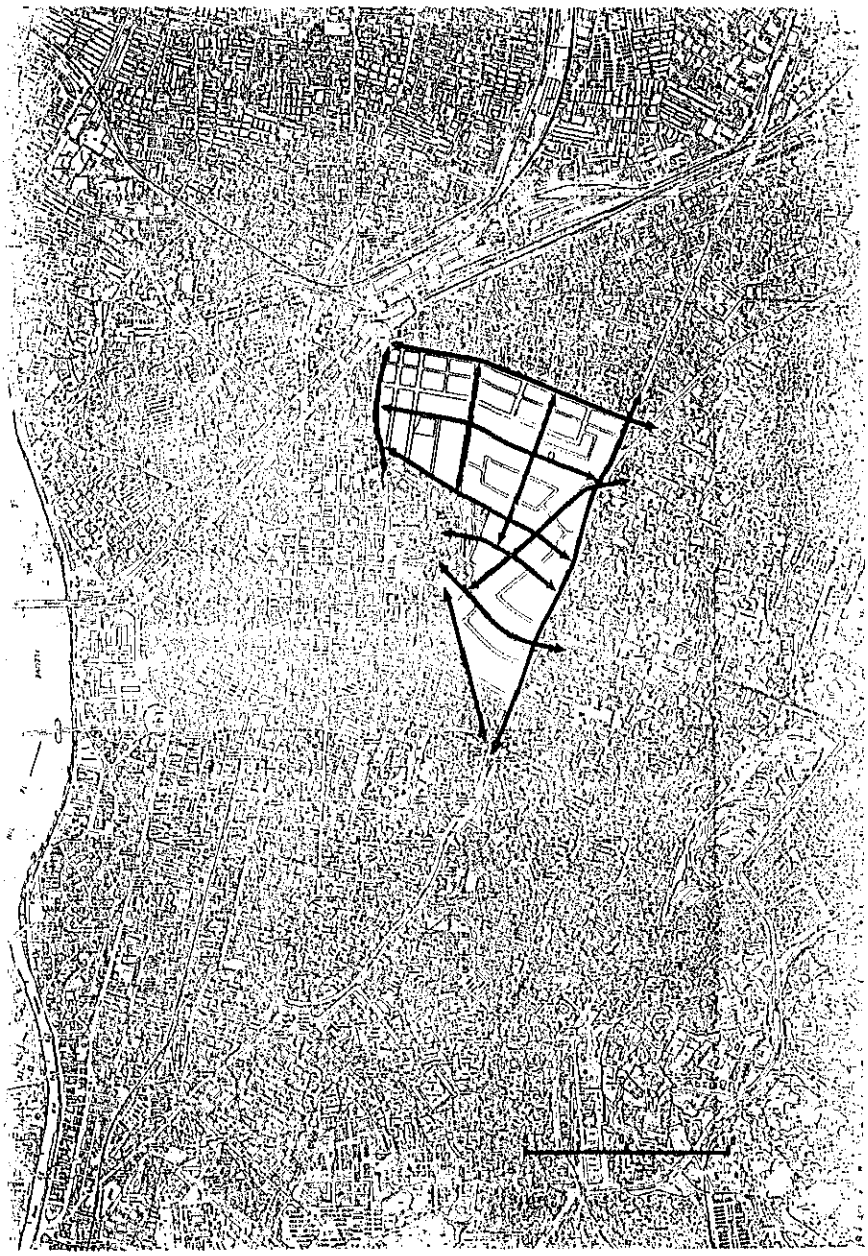


Fig. 12.4.8 Area 1 Redevelopment Plan: Road Network

In addition to the above, two north-south distributors are planned connecting Kamel Sidky st. with Nagib Al Rihani st. with a ROW of 20 and 30 m respectively. A third distributor with a ROW of 20 m, will connect Gomhouria st. with Port Said st. in the east-west direction.

The total area of the road network is approximately 35 hectares which is about 33% of the area that will be redeveloped. Fig. 12.4.8 shows the suggested road network.

3) Land Use in Area 1 Redevelopment Plan

The plan for land use in the redeveloped Area 1 incorporates the followings (Fig. 12.4.9):

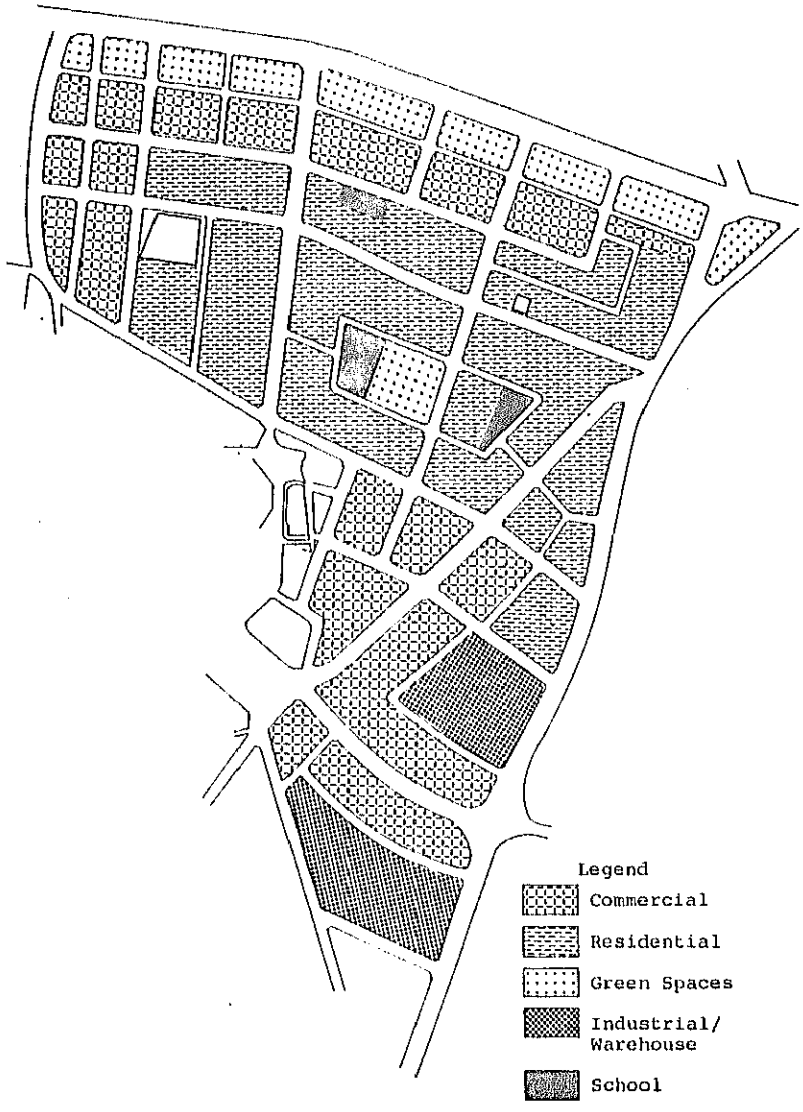


Fig. 12.4.9 Area 1 Redevelopment Plan: Land Use

(1) Provision of green space in the form of a green belt along Kamel Sidky st. Reconstruction of the old wall of Cairo shall run through this garden. It is envisaged that such a road will become one of the city's symbolic areas. There will also be a green park beside the school in the residential area.

(2) The commercial area will stretch along Kamel Sidky st. and Gomhouria st. A multi-story garage and hotels shall be constructed facing Cairo Central sta. Azhar st. shall be surrounded on both sides by commercial activity, where it is possible to connect to the Khan Al Khalili area by pedestrian pathways in the future. Gueish st. will retain the commercial activities along both its sides up to its intersection with Nagib Al Rihani st.

(3) The residential area shall be located in the northern half of Area 1, while workshops and warehouses shall be in the southern half.

(4) The existing ancient mosque and cathedral located in the northern half shall be maintained and if necessary renewed. Three plots have been assigned for schools within the residential area. One of these plots is at present being used as a school.

Table 12.4.4 shows the built up area allocated for each of the activities in the suggested redevelopment plan, and their percentages from the total.

Table 12.4.4 Redevelopment Plan Land Use by Sector

Land Use	Area (ha)	(%)
(1) Residential	28.71	27.1
(2) Commercial	22.88	21.6
(3) Industrial & Warehouse	7.64	7.2
(4) Education	1.40	1.3
(5) Roads	35.12	33.1
(6) Institutional	2.44	2.3
(7) Green Spaces	7.81	7.4
Total	106.0	100.0

Fig. 12.4.10 shows a comparison of the present conditions and of those after the redevelopment plan is implemented.

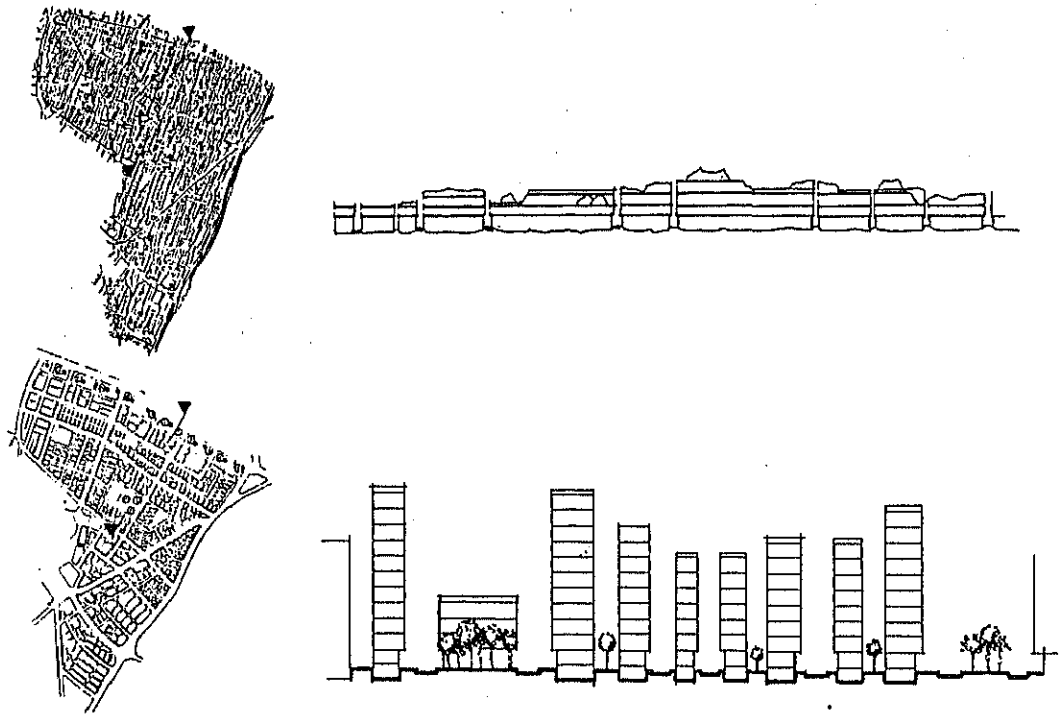


Fig. 12.4.10 Area 1 Present and Future Conditions After Redevelopment

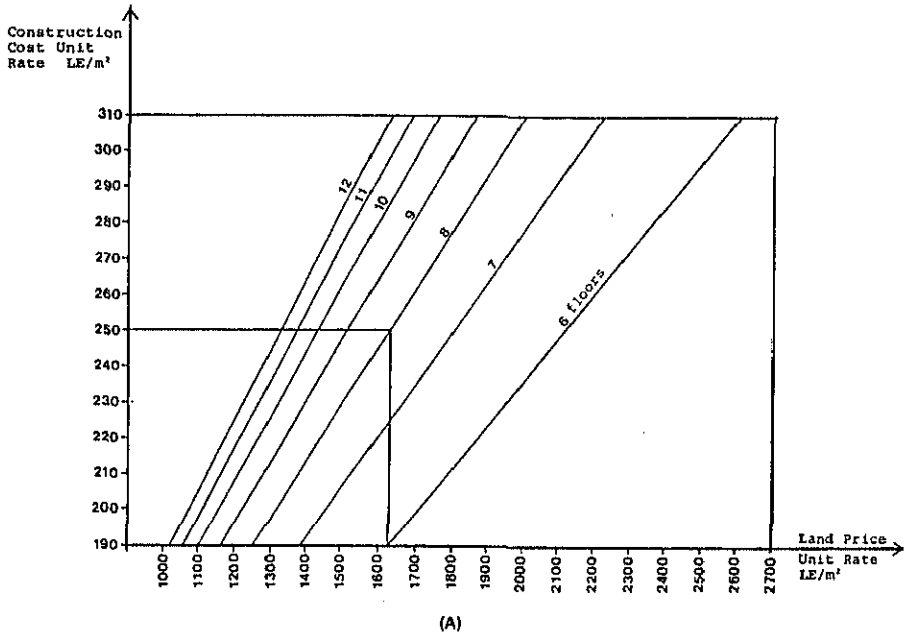
4) Financial Evaluation of the Redevelopment Plan

As the system explained in section 12.4.3.2), surplus land shall be sold and the proceeds shall be used to cover the reconstruction costs of the activities existing before total clearance, new road network and green spaces. Therefore, in order to financially evaluate this redevelopment plan it must be determined under what conditions a balance between the land sales and the construction costs can be achieved.

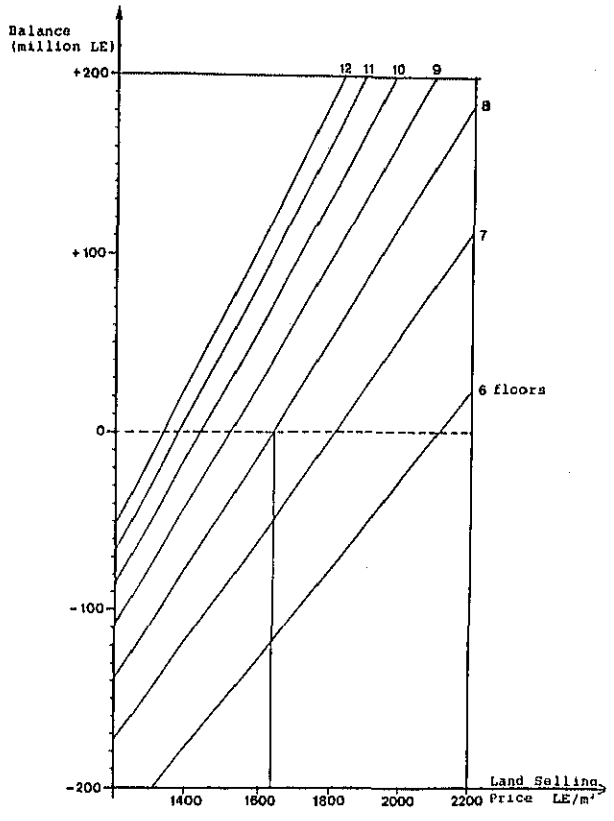
Balancing the proceeds from land sale with the cost of construction of activities existing prior to redevelopment two sets of curves can be derived as shown in Fig. 12.4.11.

The curves in Fig. 12.4.11 (a) help to determine the feasibility of the plan under different conditions of unit construction cost, unit land sale and number of floors in the buildings to be constructed. Knowing any of the two conditions, the third may be obtained. Curves in Fig. 12.4.11 (b) were drawn maintaining the construction cost at 250 LE/m2. Knowing either the number of floors or the land sale price, the other may be obtained. The green park and road network construction costs have been fixed in both graphs as the figures shown in the example in Table 12.4.5.

Assuming that the unit cost for land sale shall reach 1650 LE/m2 after redevelopment, the unit cost for construction is 250



(A)



(B)

Fig. 12.4.11 Redevelopment Plan: Financial Evaluation Curve

LE/m2 and the average height of new residential and commercial buildings shall be 8 floors. Based on calculations shown in Table 12.4.5, it can be concluded that the land sale proceeds exceed construction cost thereby making the scheme feasible. This example has been plotted on the graphs.

Table 12.4.5 Financial Scheme for Urban Redevelopment Plan in Area 1

	Present Total Floor Area (ha)	Urban Renewal Plan				Cost of Reconstructing Present Activities and New Road Network and Green Parks Construction		Revenue from Land Sale
		Land Use Scheme in Plan (ha)	Average Building Height (floors)	Total Floor Area (ha)	Land Available for Sale (ha)	Unit Cost (LE/m2)	Construction Cost (million LE)	Land Sale at Unit Cost of 1500 LE/m2 (million LE)
	(a)	(b)	(c)	(d) bxc	(e) (d-a)/c	(f)	(g) axf	(h) ex1650 LE/m2
Residential	140	28.71	8	229.68	11.21	250	350.00	184.97
Commercial	37	22.88	8	183.04	18.26	250	92.50	301.29
Industrial & Warehouse	24	7.64	5	38.20	2.84	250	60.00	46.86
Educational	2	1.40	4	5.60	-	250	5.00	-
Green Park	-	7.81	-	7.81	-	15	1.17	-
Road Network	?	35.12	-	35.12	-	50	17.56	-
Total	203	103.56	-	-	32.31	-	526.23	533.12

5) Issues to be Investigated

In this chapter, urban redevelopment by the total clearance method as adopted in Japan was presented and a general attempt was made at applying it to CORPS. It is realized, however, that many issues must be investigated before judging the feasibility of applying such a method in Egypt and the area under question.

The laws in force regulating the relationships between the landlord and tenants, and property rights must be studied. A detailed survey of Area 1 should determine such issues as the extent of space owned and being rented, actual number of plots under demolition orders or that have been judged unsafe, actual number of dwellings and population, etc. All social aspects must be studied.

In addition to the above, the possible role of the government to facilitate such a plan and the likelihood of obtaining a consensus among the concerned inhabitants should be considered.

13. Conclusion and Recommendation

13.1 Necessary Facilities and Policies

The GCMR, at present faces many urban transport problems, such as traffic congestion and traffic accidents, and tacklling such problems has become a matter of urgency. These transport problems are expected to increase in severity in the future. In the year 2000 the population is forecast to increase by 1.5 times the present population, vehicle ownership shall increase by 2.5 times, and trip number by 1.6 times.

Under such circumstances, and if neglecting to expand transportation facilities, or establishing effective policies, the streets will become so congested with vehicles that walking to one's destination will be the fastest transport mode. For example, a trip from Tahrir sq. to the directions of Roxi, downtown Giza, or Maadi is expected to take 2 or 3 hours, and 1 hour will be required only for crossing the Nile River. Should the GCMR fall into such conditions, it is feared that such deterioration would significantly damage the administrative and central role of GCMR, currently with a 40% share of the Gross National Products.

There is a wide-spread desire for vehicle ownership amongst the region's residents, and those who have vehicles insist upon using them. In order to respond to such a strong desire to use private vehicles by the residents such facilities as arterial roads and parking spaces in the city center are in urgent need.

However, the expansion of the road network to accommodate the unabated continuing demand is not possible due to financial and space constraints. Consequently it is not enough only to efficiently utilize existing facilities, but in addition and from the standpoint of controlling the transport modal share, traffic management policies should be developed.

An effective policy would be to induce the private mode trip makers to shift to public transport modes. At present 4.1 million trips (46% of the total) are daily depending on private car, and in the absence of some appropriate policies the figure will increase to 9.2 million trips in the year 2000. Considering the constraint of the present road network capacity, at least 20% of those trips should be converted to public mode; bus and railways. In the GCMR, selection of the private mode by trip makers is particularly strong and effective policies firstly to restrain private car use, and secondly to promote the public transport use are urgently needed.

The former may be achieved through such measures as increase of vehicle registration tax, increase of fuel tax, etc. and consideration of various traffic control issues such as parking control, and parking charge for on-street parking. The latter may be attained by introducing such proposals as upgrading of exis-

ting railway and construction of new railway system, as well as reinforcement of bus fleet, introduction of exclusive bus lane and deluxe bus service, improvement of inter-modal transfer, upgrading of tracks, etc.

The major transportation facilities proposed are the urban expressway network and the rapid rail network. In the future if these two networks are incapable of accommodating the major burden of the demand within the transportation system, it is feared that the deterioration of transport conditions will not be arrested.

The removal of existing buildings on a large scale in order to increase road capacity may not be possible due to the adverse effect such action may have on the society. The only other alternative is to construct a network of elevated roads on the existing road space. Such a network would comprise Expwy 1, presently under construction from Ramses sq. to Ghamra br. and its extension up to Salah Salem st.; Expwy 2, Bab Al Shaaria - Sayedah Zeinab - Ring Road; and Expwy 3, Bab Al Shaaria - Heliopolis. It is desirable that all of them be completed by the year 2000, with further extension and enlargement of the expressway system beyond the year 2000.

The expressway system, with the exception of Expwy 1, would be constructed in accordance with urban expressway standards and be operated as a full-access control toll expressway, thereby the costs of construction would be repaid within 5 to 10 years. In such a way, this network would not be a financial burden, and in addition the principle whereby beneficiaries directly pay, would be realized, making it easy to form a favorable consensus on the system.

Utilization of road space, however, may be limited. Even with a widely expanded expressway network, it would cease to function if the surface road network cannot absorb traffic from the exits of the expressway. In the long run, reorganization of surface arterial network would become necessary, comprising large-scale building demolition. Such kind of road projects should be done in coordination with urban re-development projects. In light of the constraints on expanding the road network capacity, sooner or later a sizable part of the trips made in GCMR will have to be dependent on railway transport. In order for the rail transport to compete with the bus system, and increase its share of passengers, the rail network should not be inferior to the bus network in density. However the establishment of such a dense railway shall take time and may require some suffering in economical terms, nevertheless from the point of view of long-term strategy and based on policy judgment, it should be implemented.

Initially full use would be made of the existing railway facilities. In order to achieve an increase in frequency operation and raise the speed of trains it will be necessary to secure

the ROW, and upgrade electricity, signaling, and safety facilities. In addition further study is necessary in order to introduce a high density commuter service along the ENR tracks between Shubra Al Kheima sta. via Cairo Central sta. to Giza sta.

In light of the total public transport demand, the existing railway route network is not sufficiently developed, and new routes are indispensable. The major sections of the proposed new routes of Urban Line 1, Urban Line 2, and the Regional Metro Giza Branch are underground sections within the built-up area. Although the investment cost for the construction of these lines is very huge, from the long-term point of view, their promotion is recommendable.

One of the major policies of the Egyptian government is the protection of arable land. However along the outskirts of the GCMR the relentless spread of informal housing is continuing to devour the surrounding arable land. Such areas are suffering from the lack of properly arranged road facility, together with basic infrastructures as water supply, electricity, and sanitary drainage and roads. Should the region continue to expand in the same manner as the present with no plans for arterial, collector, or local streets, then such expansion will have extremely serious transport problems. In addition if it is decided to supply such areas with the necessary infrastructures after they are developed, the required investment would be very huge and many social problems would result. Therefore in order to decrease the pressure produced by the continuing expansion of informal housing, development should be shifted to the new settlements while in areas where it is not possible to stop the urban development then every effort should be made to secure land for roads.

13.2 Necessary Investment Scale of Masterplan Projects

The Masterplan incorporates a total of 57 projects in the road, railway, bus, and CBD plans. The priority ranking of these projects are shown in Table 13.2.1. Table 13.2.2 shows the projects where the investment scale exceeds 100 million LE.

Table 13.2.1 Number of Projects by Completion Year

	Short-term (by 1994)	Medium-term (by 1999)	Long-term (After 2000)
Highway	13	11	8
Railway	5	4	5
Bus	2	3	-
CBD	8	(not scheduled)	-

Note: Two bus projects (B001 and B002) shall be continuously implemented with uniform investment over the planning period.

Table 13.2.2 Masterplan Projects Over 100 Million LE
(unit: million LE)

	Project	Cost	Rank
H002	Expwy No. 2	333.8	A
H003	Expwy No. 3	287.8	B
H102	R. Road South br.	290.8	A
H108	R. Road Western Arc.	114.8	A
H109	R. Road North Nile br.	296.0	B
H110	R. Road Qaliubiah	126.4	A
H111	R. Road Al Marg	205.0	A
H202	Kamel Sidky st.	174.9	A
H203	Rod Al Farag st.	106.4	B
H304	Ahmed Orabi st. Ext.	103.8	A
R001	Urban Metro #1, Ph.1	887.5	B
R002	Urban Metro #1, Ph.2	537.3	B
R003	Urban Metro #2	897.7	C
R004	Regional Metro Giza	361.9	B
R101	HCHD Ramses-Nozha Imp.	163.2	A
R102	HCHD Airport Ext.	284.1	C
Total		5171.4	

The total investment cost for the implementation of the 57 projects is 6,769 million LE (1987/88 prices). From this total 53% represents the foreign portion, while 47% the local portion. The investment amount by period is shown in Table 13.2.3. The investment amount for the 1990 - 1999 ten year period is 3,818 million LE, which is 56% of the total investment amount.

Table 13.2.4 shows the projects distributed by the supposed implementing agency and the investment amount that would be needed by each agency accordingly.

Table 13.2.3 Investment Amount by Period and Mode

(unit: million LE)

	1990-1994	1995-1999	Total 90-99	Beyond 2000
Road	1483.4	1248.6	2732.0	580.5
Railway	277.1	575.4	852.5	2369.8
Bus	57.9	113.9	171.8	0.0
CBD	30.9	30.9	61.7	0.0
Total	1849.3	1968.8	3818.0	2950.4
(%)	27.3	29.1	56.4	43.6

Table 13.2.4 Necessary Investment Amount by Organization

(unit: million LE)

	Project number	Invest-ment	(%)
MODANC	13	1561.9	23.1
NAT	4	2684.4	39.7
Cairo Gov.	17	1319.8	19.5
Giza Gov.	4	289.6	4.3
Qaliubiah Gov.	3	184.0	2.7
ENR	2	27.6	0.4
HCHD	4	484.0	7.2
CTA	10	217.3	3.2
Total	57	6768.6	100.0

Based on past investments, it appears that the investment scale to be borne by the agencies concerned exceeds their capacities. Funds for the projects implementation may come from additional sources such as increase of fuel tax, collection of parking charges, toll expressways and other toll systems.

13.3 Organization and Institutions

1) Establishment of New Administrative Entities

The proposed toll expressway is a new transport facility to be introduced in GCMR. In Table 13.2.4, it is supposed that Cairo Governorate will be the agency responsible for implementing the expressway system. If the expressway is considered as a Ring Road approach, perhaps implementation would be the responsibility of MODANC. In either case, after construction it is necessary for a new body to be set up for the operation and maintenance of the expressway system.

This new organization should be a part private, part public independent non-profit organization. There are two reasons for this recommendation. First, based on the financial analysis results, the expressway system is expected to easily repay from its profits the initial investment with no financial difficulty anticipated. The entity will be able to pay back the loan from the revenue with no additional burden on the national treasury. Second, such an entity would allow for the participation of the private sector with its efficiency and vitality, while utilizing the public sector's experience in management and operation of facilities with strong public nature.

Concerning the management of the urban railway system, a plan is in progress to separate the management of the Regional Metro from the ENR. This is a reasonable approach when considering the different operational aspects between urban rail transport and long haul rail transport, such as operation frequency and degree of required punctuality. It is desirable that the operation of the new subway lines also be included in the Regional Metro organization.

2) Planning and Information Center

At present many different organizations are dealing with the management and operation of urban transport facilities in GCMR, with projects scattered amongst them in line with each's main interest. More effective coordination will be needed to pursue the efficiency of future investment in different sectors, due to the complexity of urban transport which requires comprehensive policy.

The Prime Minister chairs the Higher Policies Committee, and it is necessary that a technical urban transport group be established to support the committee in various planning and technical aspects. This group should be charged with the periodic checking of the Masterplan and the assignment of project priority.

An urban transport information center to support the above proposed planning group should be set up. At present an information center is in place in the Ministry of Transport, collecting information related to regional transport in the entire country. It would be highly desirable to have a unit within the existing information center, to deal with urban transport. Such a unit would incorporate the data collected by this Study in addition to the gathering of wide ranging data, which could then be made available to any related entity.

3) Revision and Modification of the Fare System

The public transport fare is basically a public service charge, and the raising of the fare would have a direct influence on the commodity prices. Moreover, the majority of bus and rail passengers are from the relatively low-income class, and therefore the sudden increase in the fare would create social problems.

However, on the other hand the operating costs of the public transport sectors are many times higher than the revenue obtained. When operation continues by a manner in which sound financial basis is not observed, it becomes difficult to offer sound service. In addition a policy of limitless aid would only delay and obstruct any efforts to improve the financial conditions from within. Consequently it is necessary to analyze the operation costs, monitor to what extent the passengers are willing to pay, and finally advise the Higher Policies Committee on the appropriate fare level. This shall be one of the important duties that should be undertaken by the group, proposed to be established in the preceding section.

In the future, with the progress in rail facilities of the rail transport network, transfer passengers between rail and bus are expected to grow in number. It will be necessary to study the rates of the various fares applied to all types of buses and rail, and if necessary to make effort to eliminate unreasonable disparity.

13.4 Recommendations for Successive Studies

Prior to their implementation, a feasibility study may be needed for large-scale projects in the Masterplan, especially for such a project with a large foreign currency portion. In this section, the main points and items of the feasibility studies are shown for some selected projects, as examples. These projects are the Metropolitan Expressway projects (H002, H003) representing road projects, HCHD (Ramses - Nozha) upgrading project representing existing railway improvement projects, and Urban Line 1 (R001 and R002) representing new railway construction projects.

1) Metropolitan Expressways No. 2 and 3

(1) Routes

A. Ring Road southern section starting from the west bank of Zomor Canal in Omrania, Giza, via Moneib br. (Nile br.), ending at the proposed junction site with Expwy 2, north of Basatin, Cairo (approx. 4.5 km).

B. Expwy 2 starting from Ring Road southern section, via Port Said st., ending at Bab Al Shaaria sq. (approx. 8.0 km).

C. Expwy 3 starting from Bab Al Shaaria sq., via Gueish st., Abbasseya st., Khalifah Al Mamoun st., and ending at the intersection with Farik Aziz Al Masri st. (Ismailia Desert Road) and Kobba st. in Heliopolis (approx. 7.3 km).

(2) Study Items

(2)-1 Route and Road Type Selection

The main points to be considered in the route and road type selection stage are;

A. The location and type of the Expwy 2 - Ring Road junction should be planned taking into consideration the future extension of Expwy 2 to Maadi.

B. The route and road type should be selected to minimize the influence to the future housing development area, historic area and the tourist site in Fustat.

C. The route between Salah Salem st. and Sayedah Zeinab sq. should be planned to meet the demand generated from around the square, and at the same time the negative influence to the mosque should be minimized.

D. The structure at the intersection with Port Said st. and Azhar st. should be planned paying due consideration to the existing flyover.

E. The influence to Ain Shams University caused by the Expwy 1 (6th Oct. Extension) - Expwy 3 junction should be studied.

F. The structure on Khalifah Al Mamoun st. should be planned taking the environmental conditions into consideration.

G. The ending point of Expwy 3 should be selected to meet the demand from Roxi sq.

(2)-2 Review of Traffic Demand, and Traffic Circulation Plan

The main points to be reviewed in the traffic demand forecast are;

A. There is no information on the relationship between tariff rate and demand on an urban toll road in Egypt, therefore it must be reviewed by an interview-type survey, or the application of a conversion model for estimating the demand on toll roads should be studied.

B. In the Masterplan, the trip demand was estimated for the year 2000, therefore the trip demand increase beyond the year 2000 and the saturation traffic flow on the toll road should be estimated.

C. The Moneib br. lane number and ramps should be studied.

D. The traffic circulation plan at the ramp entrances and exits should be planned.

(2)-3 Topographic Survey
(2)-4 Study on Sub-soil
(2)-5 Preliminary Design

In addition to the preliminary design of roadways (through way, ramps and street below viaducts), and structures and their execution plan, the preliminary design of a toll road should include the design of such auxiliary facilities as toll gates, emergency parking and emergency exits on viaducts and traffic control facilities and equipment (automatic traffic counter, VTR, traffic information board and their communication system), so as to provide high quality service and full access control system.

(2)-6 Cost Estimate and Implementation Schedule
(2)-7 Operation Plan

The following items should be studied in the operation plan;

A. Objective to collect charge, eg. the target redemption period, and the operation after redemption.
B. Operation policy on cost to be covered by the collected charge, ie. all the cost or maintenance and operation cost only.
C. Toll collecting system, eg. by cash, by coupon, by card or by coin.

D. Operation Organization, including toll collecting unit, maintenance unit, management unit, traffic control unit and planning unit, and operation plan including required staff, facilities and equipment.
E. Operation cost estimate.

(2)-8 Financial Evaluation

In the financial evaluation, the application condition for the following as discussed in the Masterplan should be studied in more detail for the realization of projects.

A. Tariff rate in accordance with appropriate level of traffic demand and revenue.
B. Vehicle classification and tariff rate by their classification.
C. Tariff increase in accordance with price escalation.
D. Expected toll collection efficiency.
E. Fund source, loan condition and interest rate.
F. Financial statements.
G. Financial evaluation.

(2)-9 Economic Evaluation

In the economic evaluation, the following items covered in the Masterplan should be reviewed.

A. Vehicle operating cost.
B. Time value of passenger.
C. Benefit by VOC and time saving.
D. Economic evaluation indices.
E. Relationship between tariff rate and benefit received.

In addition to the above, the following items should be discussed.

F. Indirect benefit.
G. Comprehensive economic evaluation.

(2)-10 Review of Legal Framework

The present legal framework should be reviewed from the standpoint that toll roads should be consistent with public needs and profitability.

A. Scope of authority given to the entity during construction and operation, on financial affairs, on taxation, on tariff rate decision and on surplus money operation; reinvestment, dividend, or sustained profit.
B. Responsibility of the entity, ie. specification of route falling under its responsibility, operation period, and so on.
C. Responsible facilities of the entity.
D. Authority on traffic control given to the entity.

E. Demarcation of responsibility and authority between supervising institution and the entity.

2) **Heliopolis Metro Ramses - Nozha Line**

The main points to be discussed in further detail are;

(1) Train Formation Plan

A. Re-examination of car specification for 6-cars train formation.
B. Review of required number of cars.

(2) Signal Plan

A. Introduction of way-side automatic signals.
B. Introduction of CTC and ATC.
C. Modification of road traffic signals to give priority for train operation.
D. Introduction of signals and cross bars at railway crossings.

(3) Power Supply Plan

A. Installation and enhancement of sub stations.
B. Review of aerial trolley line.

(4) Civil Works

A. Review of the scope to improve existing track.
B. Further study of alternatives shown in Chap. 16, ie. viaduct, surface and underpass.
C. Railway operation plan during construction.

(5) Car Depot

A. Review of necessity of car depot for improved line.
B. Review of size and location of a car depot.

(6) Topographic and Sub-soil Survey
(7) Demand Forecast

A. Review of demand by fare.
B. Review of possibility of modal change from private to rail.
C. Review of fare collecting system.

(8) Financial Evaluation

A. Financial cost estimate in further detail.
B. Review of estimated sales amount.
C. Further study of financial viability.

3) Urban Line 1

(1) Study Items

(1)-1 Route Plan

A. Route alternatives for phase I of NAT and that in the Masterplan should be reviewed.
B. Route for phase II should be reviewed in view of the possibility to collect the demand along Ahram and King Faisal streets, and from the heart of Giza.
C. Review and finalization of the station locations.

(1)-2 Rolling Stock Plan

A. From the viewpoint of cooperation with Regional Metro Line, the existing models usedin Regional Metro Line are desirable. On the other hand, application of the third rail, smaller sized car, linear motor car, etc., should be studied to lessen the tunnel size and to reduce the construction cost. The saving of the construction cost and the saving of operating cost by using common model in both alternatives should be compared.
B. Review of required number of cars.
C. Review of car depot location.

(1)-3 Signal Plan

Review of existing signal system plan.

(1)-4 Power Supply Plan

Review of existing power supply plan.

(1)-5 Civil Works

The application of shield driving method, cut and cover method or immersed tunnel method should be studied by section, considering the selected car size and model, and the related street widening plan.

(1)-6 Economic and Financial Evaluation

Review of relationship between demand and fare.
Review of relationship between station locations and demand.
Estimate of converted railway passenger from car users.
Economic evaluation.
Financial evaluation.

A favorable financial performance will not be expected in the financial evaluation in accordance with the study results in Chapter 16, therefore the way to compensate at least the operating cost should be studied.

(2) Notes for conducting the study

(2)-1 Maximum utilization of existing plans and designs

Route, signals, car, civil works, power supply, station locations and structures have been studied in detail. Experiences of Regional Metro construction available in NAT should be utilized in the study adding some new technology, which has not been considered in the former studies and the execution.

(2)-2 Highlights of the study

Low profitability of the subway is the main point to be discussed in the study. Stress should be placed on improving financial features by seeking well balance of such contradictionary factors as saving of construction cost and station numbers, and fare and demand.

PART III
PRE-FEASIBILITY STUDY
ON SELECTED PROJECTS

PART III

Introduction

In this part, the results of the preliminary feasibility studies will be stated on several projects selected from the Masterplan projects. The studies aim mainly at evaluating the projects from the economic and financial points of view.

In the course of the Masterplan study, seven projects were short-listed by the JICA Study Team as having high priority, and being of urgent need. The Egyptian authority selected three projects from the seven; Sekket Al Wayli st. improvement, Rod Al Farag Bridge Giza approach, and HCHD Ramses - Nozha line upgrading projects. Later, the former two projects were combined into one project under the name of Inner Ring Road Northern Package.

At the final stage of the Masterplan study, and as a result of discussions between Cairo Governorate and the JICA Study Team three other projects were added to the list. Those projects are the construction of Metropolitan Expressway Nos. 2 and 3, and Kamel Sidky st. Widening Project, all of which were larger in scale physically and financially than the projects previously selected, and which were envisaged to have strong impact on future traffic conditions in GCMR.

However it should be noted that any of the other projects in the Masterplan are not necessarily less important nor less worthy than those selected for the pre-feasibility study. Some important projects were not taken up by the reasons that their implementation had already been decided or their related feasibility studies were under way.

The results of the analysis on the five projects are explained hereinafter. Concerning the economic and financial analysis methods, the following points must be noted:

(1) Projects Implementation Period

The pre F/S projects were evaluated on the assumption that design and land acquisition for the projects shall commence in 1990 followed by construction work, without delay. The proposed schedule of each project in the Masterplan will not coincide with that of the pre F/S projects because the pre F/S projects were evaluated under the assumption that they will all commence at the same date, 1990, while in making the Masterplan schedule, financial constraints of each year were taken into consideration.

(2) Subjects of the Economical and Financial Appraisal and Evaluation

The economic analysis examines whether the investment to a project can be justified or not from the viewpoint of national or regional economy. On the other hand, the financial analysis tests the profitability of a project from the standpoint of the business entity in charge, under reasonably assumed conditions for loan terms, tariff rate, equity rate, as well as other factors.

(3) Appraisal/Evaluation Indices and the Unit Prices

The appraisal/evaluation indices and the unit prices used in this analysis are summarized as follows:

	Subjects	Evaluation indices	Unit prices
Economic Appraisal	Profitability	EIRR, B-C, B/C	1987/88 domestic economic prices
Financial Analysis	Profitability	FIRR	1987/88 domestic economic prices
	Stability	Investment recovery period	Current prices
		Maximum amount of debt	Current prices

The Economic Internal Rate of Return (EIRR) is a discount rate which makes the present value in a base year of the economic costs equal to the present value of the benefit generated by the project concerned. It means the maximum real interest rate at which the project makes no contribution to the national economy. Therefore, the EIRR is compared with the rate of Capital Opportunity Cost (12% in Egypt), and when it can exceed that rate, the project is judged to be economically viable. "B-C" is called Net Present Value of the project discounted by a given rate (COC rate is adapted in this Study), and the greater the positive value, the better. B/C ratio can be induced from the benefit and cost.

In case of the Financial Internal Rate of Return (FIRR), the meaning is the same as the EIRR. It can be calculated through replacing the economic cost by the incremental expenditure and the benefit by the incremental revenue, and it is compared with the real interest rate (= nominal interest rate - inflation rate). The investment recovery period is a period from the starting year of the project to the first year when all the accumulated deficit will be cleared. In this financial analysis, when converting the values at 1987/88 constant prices into ones at current prices, the following escalation/inflation rates are assumed:

For locally made commodity/service ≈ 13%/annum
foreign made commodity/service ≈ 5%/annum

These rates are estimated based on the analysis of past trends and recent situations. Devaluation rate of Egyptian pound against US dollar will be defined as the gap of two inflation rates, and taken as 8% per annum.

The following borrowing and repayment conditions of the loans are adopted in this financial analysis:

	Annual interst rate (%)	Maximum borrowing period (years)	Grace period (years) (2)	Amount of re-payment
Long term foreign loan	9	23	10	(1)
Long term domestic loan	15	15	5	(1)
Short term domestic loan	20	-	-	

Note: (1) Uniform annual repayment of the prinicipal and interest
(2) Only the interest is repaid

(4) Demand and Benefit Forecast

In both cases of the economical and financial analysis, O-D traffic volumes are assigned on the road and railway network. In the economic analysis the aggregated vehicle and railway operating cost is calculated as the benefit of a project and defined as the saving in such operating cost caused by the project.

On the other hand, in the financial analysis only the demand for the project facility/service is highlighted and the benefit (profit) is estimated as the difference of incremental revenue and expenditure.

14. Metropolitan Expressway Projects

14.1 Introduction

In the road network of GCR, 6th Oct. br., which is a 4.1 km full access controlled elevated road starting from Dokki in Giza and ending at Ramses sq. accommodates heavy traffic. The extension work of this road up to Ghamra br. on Port Said st. is going to be completed in March 1989, and further extension up to Salah Salem st. is in the planning stage. Expwys 2 and 3 are planned to form the elevated expressway network in GCR urban area incorporating with 6th Oct. br. as the first link of the network. 6th Oct. br. is referred to as Expwy 1.

The area surrounded by the inner ring road is densely built up and the most realistic way to increase the road traffic capacity in the area to cope with the future demand is to utilize the existing road space and the construction of multi-story structures.

Another effective way to secure the needed traffic capacity of the road is to physically control access in order to reduce the road side friction. The elevated road network can realize this objective.

On the full access controlled road it is possible to introduce toll system, thereby causing the road users to invest in the road construction and maintenance. This would consequently save the public investment for the road sector.

14.2 Highway Planning

14.2.1 Design Standard

1) Lane No.

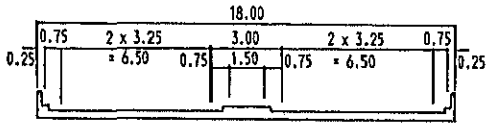
From the viewpoint of traffic demand supply balance, it is desirable to have more than 6 lanes, however the actual available space allows the construction of a 4 lane highway with minimum building purchase.

2) Design Speed

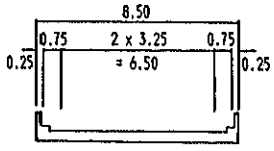
The high standard design speed of 80 km/h is desirable from the view point of traffic flow, however the reduced design speed of 60 km/h is applied to limited sections to avoid building purchase. The minimum curve radius used was 160 m.

3) Cross Section

Typical cross sections of the single and the double sections are shown in Fig. 14.2.1. Lane width of 3.25 m per lane is applied.



Double Section



Single Section

Fig. 14.2.1 Typical Cross Sections of Expwy

14.2.2 Outline of the Route

1) Expwy 2

Expwy 2 corresponds to the southern half of the traffic corridor that joins together Heliopolis, central Cairo and the Giza district, starting from the Ring Road in the southern part of Fustat and ending at Bab Al Shaaria. Of the 8.0 km total length, a 3.47 km section passes along Port Said st.

The southern tip of the road will be connected with the Nile River bridge of the Ring Road to serve the traffic between central Cairo and the area to the west of the ENR tracks in Giza, diverting it from the highly-congested Giza sq.

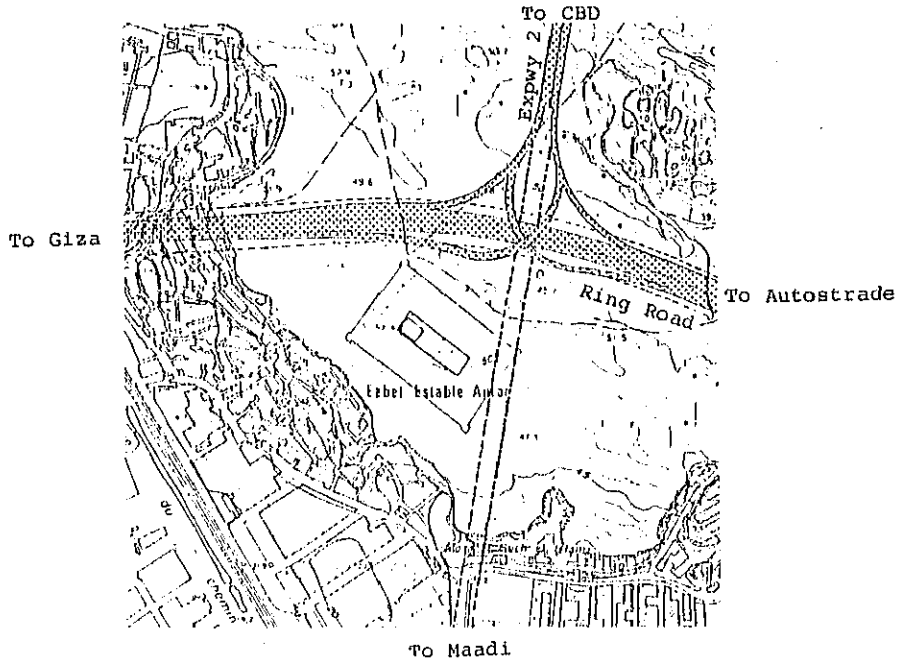


Fig. 14.2.2 Proposed Junction with Ring Road

A junction with the Ring Road will be provided in the Fustat district. The structure of the junction will be such as to allow Expwy 2 to be extended further south to the Maadi and Helwan districts in the future (Fig. 14.2.2).

The hilly area north of the connecting point with the Ring Road is reserved by Maadi Development Co. for future housing development (Fig. 14.2.3). At present the area is partially utilized by illegal housing and partially as a garbage dumping site. Route alternatives can be studied to detour this area either to the east (alternative B) or to the west (alternative A2).

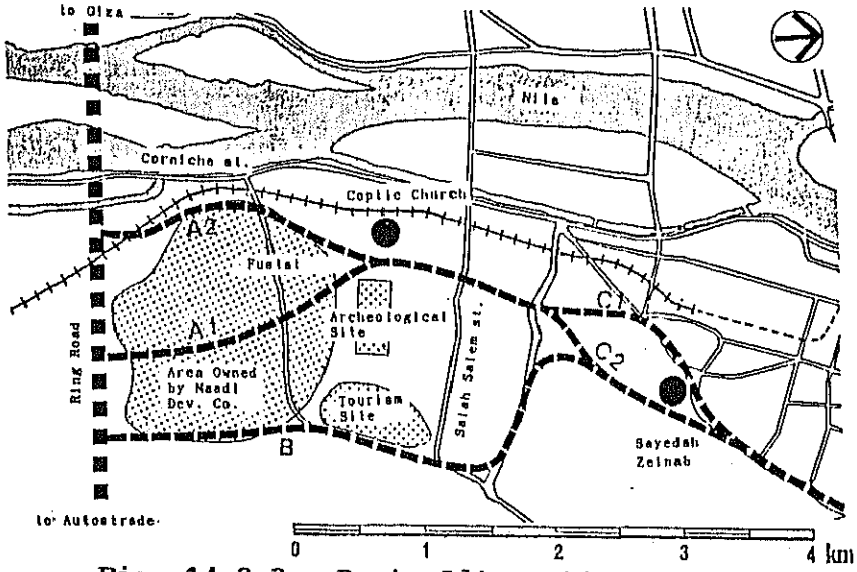


Fig. 14.2.3 Route Alternatives of Expwy 2

In case of alternative route A1, a depressed cross section can be recommended as a countermeasure against the noise and visual pollution which may affect the future housing development.

In case of alternative route A2, passing through the reserved housing area can be avoided, however building compensation is required in the area between the Regional Metro Helwan Line and the hilly area. The junction with Ring Road should be constructed on a viaduct above Helwan line and accordingly higher construction cost is anticipated in this alternative.

Both route alternatives A1 and A2 are planned to detour the reserved touristic and archaeological sites in Fustat area, east of the Coptic Museum.

The section between the Ring Road and Sayedah Zeinab sq. in alternative route A will have to use the narrow (minimum width of 14 m) street in Old Cairo and the Sad Al Barrani st. For this reason, about 2.3 km of the section will be a double-deck structure (Fig. 14.2.4).

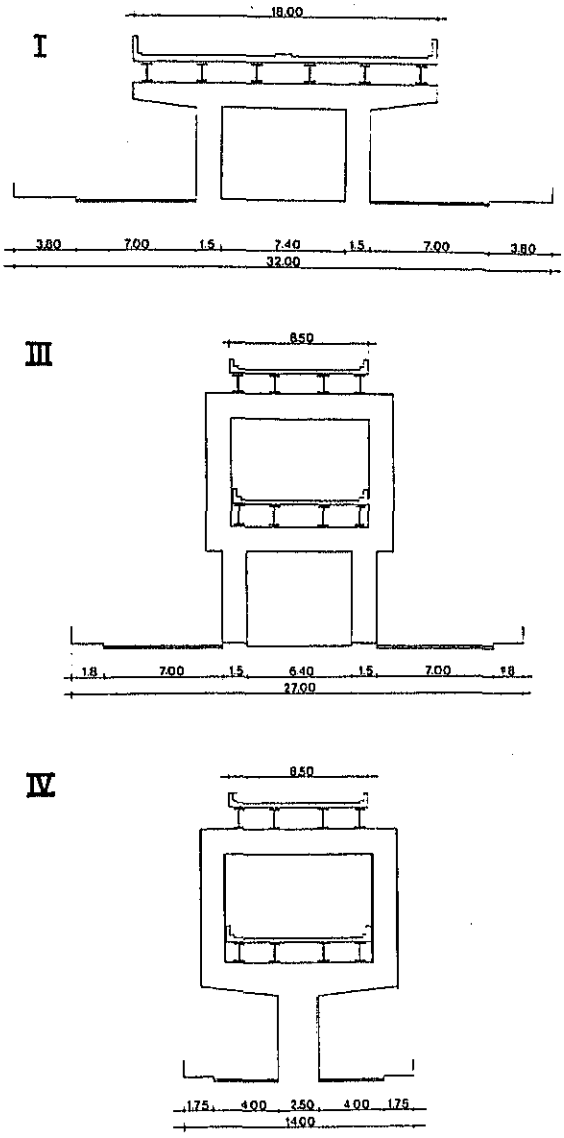


Fig. 14.2.4 Structure Types of Expwy 2

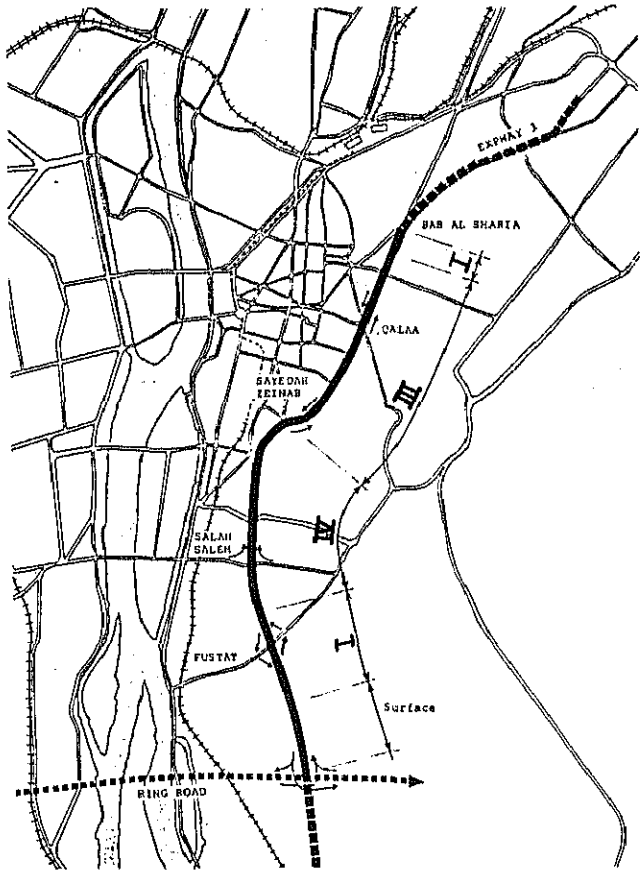


Fig. 14.2.5 Outline of Expwy 2

Passing through the area reserved for future development can also be avoided by applying alternative route B towards the east. However, this alternative has the disadvantage that the detour length is rather long and building compensation will be required in the area between Salah Salem st. and Sayedah Zeinab sq.

In alternative C1, care should be paid to the extent of visual intrusion created by the construction of the elevated road in the front of Sayedah Zeinab Mosque. Alternative route C2 passes behind the mosque, but building compensation is required.

This Study adopts the route alternative A1 - C1 route as the base case because of the minimum building compensation.

In the vicinity of Sayedah Zeinab sq., open roadside space will be used to provide on/off ramps in the Ring Road direction (Fig. 14.2.5). On/off ramps in the Ring Road direction will also be provided between Qalaa and Azhar streets, since this is where the tramway leaves Port Said st. for Attaba sq. via Qalaa st.

A flyover is located at the intersection with Azhar st. to accommodate straight-through vehicles coming from the direction of Ghamra br. above Port Said st., and going towards Sayedah Zeinab sq., and for left-turning vehicles coming from the direction of Salah Salem st. on Azhar st. and likewise moving toward Sayedah Zeinab sq. Expwy 2 is planned so as to incorporate the flyover and pass over the existing Azhar st. (Figures 14.2.6 and 14.2.7).

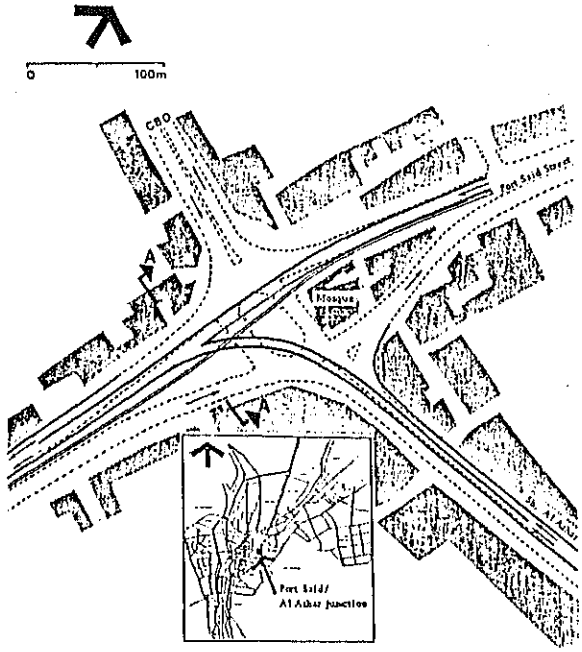
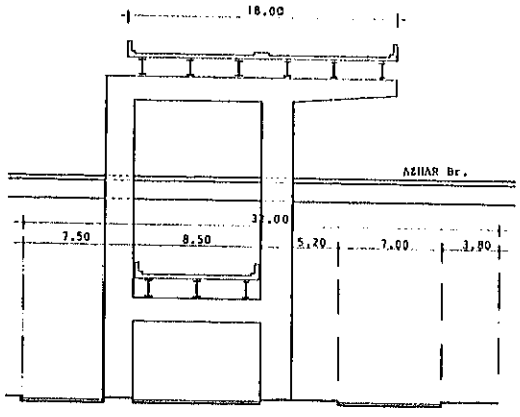


Fig. 14.2.6 Present Azhar St. Intersection



Section A-A

Fig. 14.2.7 Proposed Structure on Azhar St. Flyover

2) Expwy 3

Expwy 3 will be built between Bab Al Shaaria sq. on Expwy 2 and Kobba st., using the available space over Gueish st., Abbasseya st., Khalifah Al Mamoun st., and Gisr Al Suez st. (Ismailia Desert Road). The road will process traffic between Heliopolis and central Cairo.

Port Said st. intersects with Gueish st. at Bab Al Shaaria sq., where relatively wide space is available nearby. An on/off ramp for traffic moving from central Cairo toward Heliopolis will be provided at this point (*Fig.* 14.2.8).

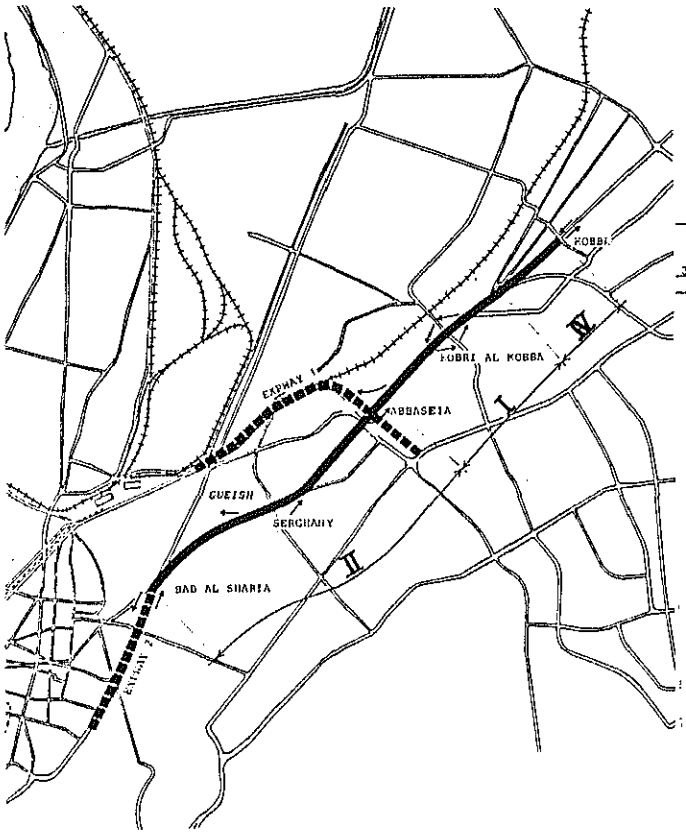


Fig. 14.2.8 Outline of Expwy 3

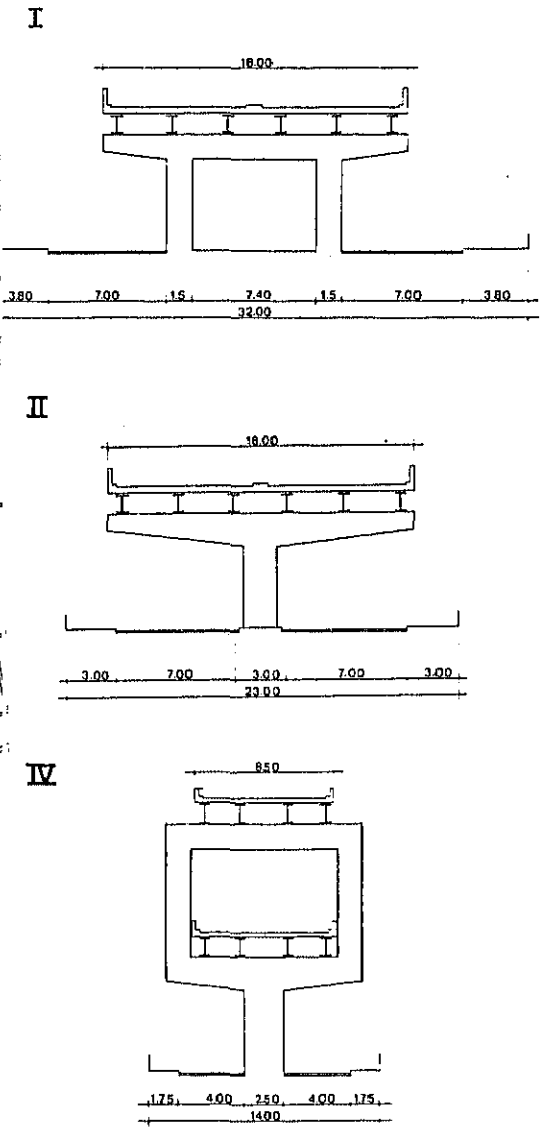


Fig. 14.2.9 Structure Types of Expwy 3

The 27m-wide Gueish st. at present has four lanes and segregated tramway track in the center. The track is expected to be removed in the future owing to the low efficiency of the tramway (it competes with the Heliopolis Metro but serves a shorter route, and there are few passengers.) Thus, Expwy 2 is basically designed as a single-deck structure with its piers constructed in the center track area (Fig. 14.2.9). However, as Gueish st. is not wide enough to allow construction of a ramp entrance/exit on its surface, on/off ramps for traffic moving from central Cairo to Heliopolis will be provided on Abbasseya st. (near Gueish sq.), which crosses Gueish st. diagonally, and on Serghany st.

At Abbasseya sq., where Expwy 3 intersects with 6th Oct. br. (Expwy 1), the Ain Shams University premises will be partially used to build connecting links (Fig. 14.2.10) with Expwys 1 and 2, in order to serve traffic on Expwy 1 going in the direction of central Cairo and traffic on Expwy 2 in the direction of Heliopolis. The links will enable travelers starting out in the Heliopolis district to choose either Expwy 1 or 2 when traveling toward Giza.

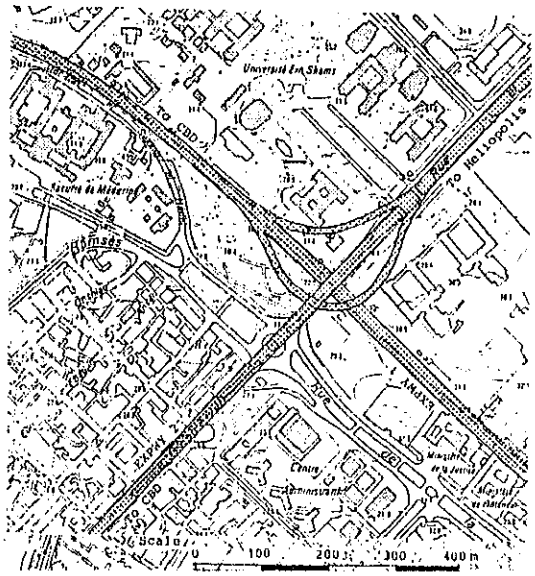


Fig. 14.2.10 Proposed Junction of Expwys 1 and 3

At Kobri Al Kobba, where Expwy 3 intersects with Sekket Al Wayli Road (which is positioned as a part of the inner ring road), the wide open space of the Khalifah Al Mamoun st. will be used to construct a diamond intersection.

Since the Gisr Al Suez st. is only 20 m wide between Kobri Al Kobba and the Kobba st. intersection, Expwy 3 is designed as a double-deck road in this section.

Past the Kobba st. intersection, Gisr Al Suez st. is provided with a wide median, and its intersection with Mataria st. is grade-separated. Therefore, the Road Network Improvement Plan proposes that Expwy 3 be terminated at the Kobba st. intersection for the following reasons:

a. Capacity is adequate for meeting demand.
b. The intersection is close to Roxi sq.
c. There is enough space to allow the elevated road to be extended in the future.

14.3 Demand Forecast

1) Forecast Condition

The future traffic demand on Expwys 2 and 3 are estimated under the following conditions:

a. Since Expwy 2 starts from the Ring Road and the main objective of this route is to divert the traffic from the heavily congested Giza sq., the southern sections of Ring Road from Giza to Autostrade including Nile br. should be completed before the opening of Expwy 2.

b. Expwy 1 (6th Oct. br. and its extension) will be completed before the opening of either Expwys 2 or 3. This condition will not affect the traffic demand on Expwys 2 and 3 so much, however this condition is considered practical since the extension of Expwy 1 is currently under planning.

2) Forecast Case

The demand forecast was made for the following cases:

(1) From the physical view point:

a. The case where Expwys 2 and 3 are completed.
b. The case where only Expwy 2 is completed.
c. The case where only Expwy 3 is completed.

(2) From the operational view point:

a. The case where all the roads are toll free.
b. The case where Expwys are toll elevated roads.
c. The case where Expwys and the Ring Road Nile br. are toll roads and bridge respectively.

The optional cases of Expwy 2 Maadi extension, and without the connection between Expwys 1 and 3 are also prepared to study the influence of these links.

3) Forecast Result

Tables 14.3.1 to 14.3.3 show the average daily traffic demand in the year 2000. The demand on Expwy 2 ranges from 70 to 90 thousand pcu/day in either case of operating the Nile br. as a toll bridge or not.

Table 14.3.1 Demand when All Components are Free
(unit: 1,000 pcu/day)

Case	Nile br.	Expwy 2	Expwy 3
1 Nile br. + Expwy 2	197	91	--
2 Nile br. + Expwys 2 & 3	197	78	81
3 Expwy 3	--	--	88

Table 14.3.2 Demand when Expwys are Toll Roads, Nile Br. is Free
(unit: 1,000 pcu/day)

Case	Nile br.	Expwy 2	Expwy 3
1 Nile br. + Expwy 2	181	63	--
2 Nile br. + Expwys 2 & 3	180	68	61
3 Expwy 3	--	--	46

Table 14.3.3 Demand when All Components are Toll Roads
(unit: 1,000 pcu/day)

Case	Nile br.	Expwy 2	Expwy 3
1 Nile br. + Expwy 2	130	82	--
2 Nile br. + Expwys 2 & 3	130	87	72
3 Expwy 3	--	--	46

Fig. 14.3.1 shows the future traffic flow on Expwys 2 and 3 in the year 2000 for the case where all the Expwys are toll roads. The most heavy traffic of 110 thousand pcu/day is seen at the section between Salah Salem st. and Sayedah Zeinab sq., where the existing narrow space allows the construction of the double deck type 2 lane expressway.

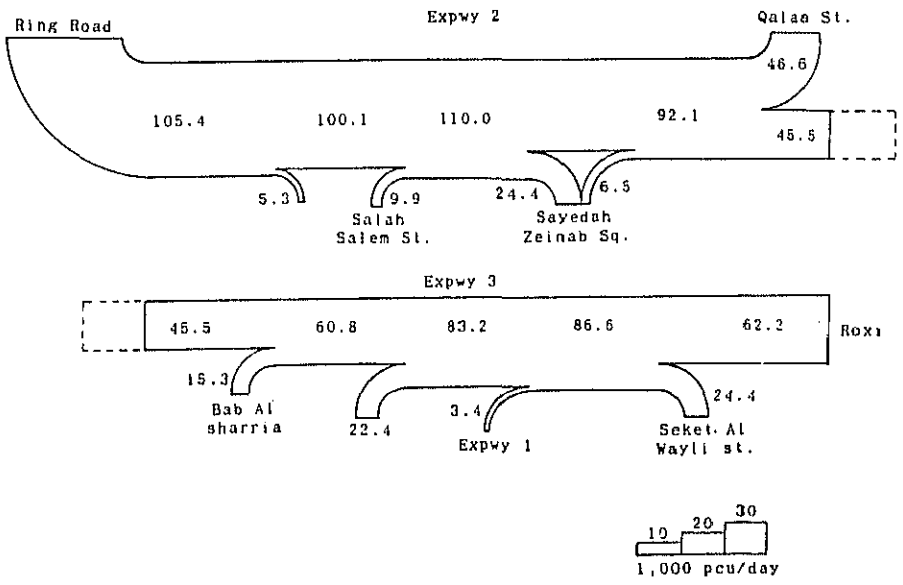


Fig. 14.3.1 Future Traffic Flow on Expwys 2 and 3 (Year 2000)

14.4 Construction Cost Estimate

1) Cost by Road Type

Table 14.4.1 shows the construction costs of various types of viaducts with a standard span of 30 m. The viaduct types are illustrated in Fig. 14.4.1. Types 1 and 2 are single deck type viaducts, and types 3 and 4 are double deck type viaducts. Types 2 and 4 are the single column type, and are applied in the section where the space for pier is limited. Type 5 is a 2-lane viaduct and will be applied for separated sections or for ramps.

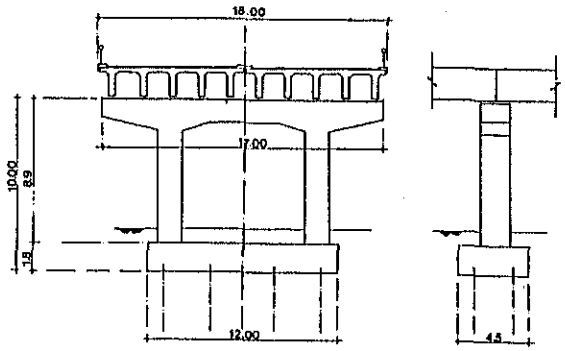
2) Estimated Results

Table 14.4.2 shows the results of the cost estimate by type. The total financial cost for Expwy 2 is estimated at 96.8 million US$ and 111.2 million LE, and 84.5 million US$ and 93.5 million LE for Expwy 3 in foreign and local currency portion respectively.

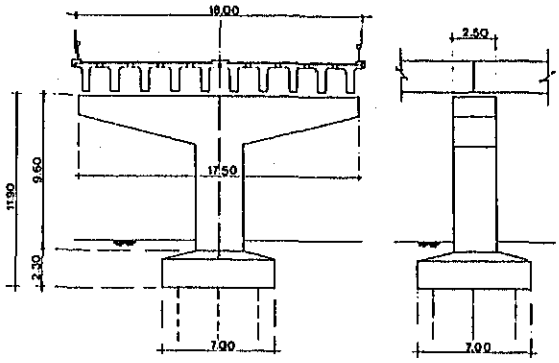
Table 14.4.1 Costs by Viaduct Types

(unit: per Meter)

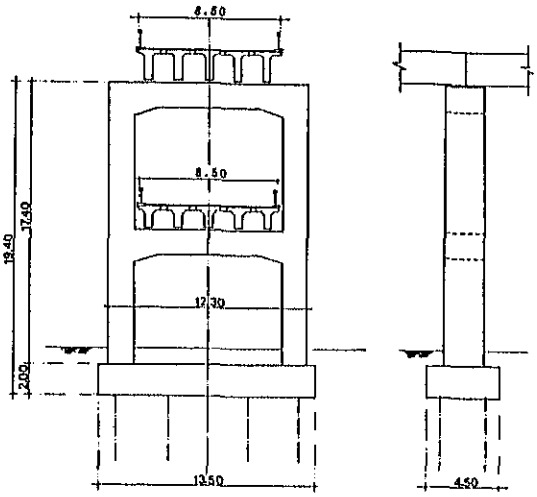
Item			Type 1	Type 2	Type 3	Type 4	Type 5
1 Substructure	FOREIGN	US$	487.32	737.37	1,134.29	1,227.90	250.83
	LOCAL	LE	785.88	1,430.55	2,277.12	2,497.46	455.31
	ECONOMIC	LE	1,970.10	3,198.12	5,010.94	5,440.46	1,059.93
2 Piling	FOREIGN	US$	800.96	901.08	800.96	800.96	400.48
	LOCAL	LE	665.24	748.40	665.24	665.24	332.62
	ECONOMIC	LE	2,768.80	3,114.90	2,768.80	2,768.80	1,384.40
3 Pile Head Treatment	FOREIGN	US$	6.56	7.38	6.56	6.56	3.28
	LOCAL	LE	7.14	8.03	7.14	7.14	3.57
	ECONOMIC	LE	25.05	28.18	25.05	25.05	12.52
4 Superstructure	FOREIGN	US$	5,470.81	5,470.81	5,470.81	5,470.81	2,718.49
	LOCAL	LE	3,445.73	3,445.73	3,445.73	3,445.73	1,711.25
	ECONOMIC	LE	17,356.60	17,356.60	17,356.60	17,356.60	8,626.88
5 Total of Direct Cost	FOREIGN	US$	6,765.65	7,116.64	7,412.62	7,506.23	3,373.08
	LOCAL	LE	4,903.99	5,632.71	6,395.23	6,615.57	2,502.75
	ECONOMIC	LE	22,120.55	23,697.80	25,161.39	25,590.91	11,083.73
6 Indirect Cost	FOREIGN	US$	1,334.67	1,434.85	1,528.97	1,557.38	669.18
	LOCAL	LE	3,069.75	3,300.15	3,516.64	3,581.98	1,539.13
	ECONOMIC	LE	6,636.16	7,109.34	7,548.42	7,677.27	3,325.12
7 E/S Cost	FOREIGN	US$	578.36	621.77	662.56	674.87	289.98
	LOCAL	LE	1,330.22	1,430.06	1,523.88	1,552.19	666.95
	ECONOMIC	LE	2,875.67	3,080.71	3,270.98	3,326.82	1,440.89
8 Contingency	FOREIGN	US$	867.87	917.33	960.41	973.85	433.22
	LOCAL	LE	930.40	1,036.29	1,143.57	1,174.97	470.88
	ECONOMIC	LE	3,163.24	3,388.79	3,598.08	3,659.50	1,584.97
Grand Total	FOREIGN	US$	9,546.55	10,090.58	10,564.56	10,712.33	4,765.47
	LOCAL	LE	10,234.36	11,399.21	12,579.32	12,924.72	5,179.71
	ECONOMIC	LE	34,795.62	37,276.64	39,578.86	40,254.50	17,434.71



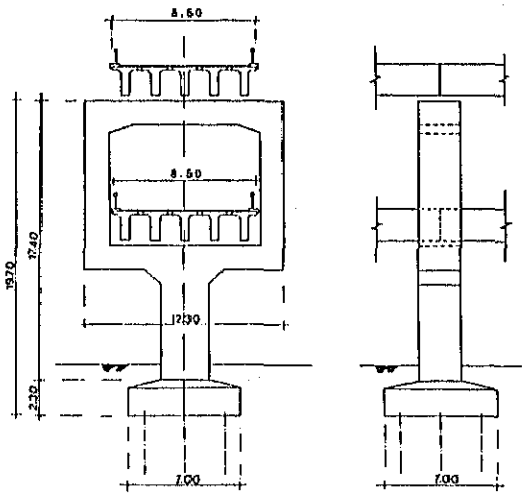
(1) Single Deck Double Column Type



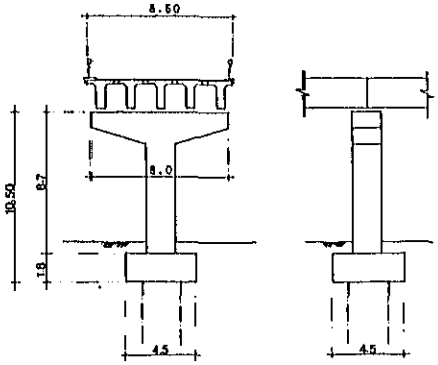
(2) Single Deck Single Column Type



(3) Double Deck Double Column Type



(4) Double Deck Single Column Type



(5) Two Lane Viaduct

Fig. 14.4.1 Proposed Viaduct Types

Table 14.4.2 Summary of Expwy Projects Cost

Description	LENGTH (KM)	UNIT PRICE			PRICE			
		Financial Cost		Economic Cost	Financial Cost		Total Financial Cost	Total Economic Cost
		Foreign (MUS$)	Local (MLE)	(MLE)	Foreign (MUS$)	Local (MLE)	(MLE)	(MLE)
EXPWY No.2								
1 Ground Level Section	1.03	0.66	1.16	2.78	0.68	1.19	2.76	2.86
2 Viaduct Type 1	2.07	9.55	10.23	34.80	19.77	21.18	66.64	72.04
3 Viaduct Type 2	0.90	10.09	11.40	37.28	9.08	10.26	31.15	33.55
4 Viaduct Type 3	1.80	10.56	12.58	39.58	19.01	22.64	66.36	71.24
5 Viaduct Type 4	2.30	10.71	12.92	40.25	24.63	29.72	86.37	92.58
6 Viaduct Type 5	4.14	4.77	5.18	17.43	19.75	21.45	66.87	72.16
7 Azhar Br.	0.35	11.09	13.69	41.91	3.88	4.79	13.72	14.67
SUBTOTAL	12.59				96.80	111.23	333.87	359.10
8 Maadi Ext.	3.7				35.11	37.96	118.71	128.26
Total	16.29				131.91	149.19	452.58	487.36
EXPWY No.3								
1 Viaduct Type 1	5.10	9.55	10.23	34.80	48.71	52.17	164.19	177.48
2 Viaduct Type 2	1.05	10.09	11.40	37.28	10.59	11.97	36.34	39.14
3 Viaduct Type 4	1.10	10.71	12.92	40.25	11.78	14.21	41.31	44.28
4 Viaduct Type 5	1.70	4.77	5.18	17.43	5.24	5.69	17.77	19.17
5 HCHD Br.	0.50	10.57	12.57	39.55	5.29	6.30	18.44	19.78
6 6 Oct. JC					2.86	3.11	9.69	10.46
SUBTOTAL	9.45				84.47	93.45	287.74	310.30
Total w/o Maadi Ext.	22.04				181.27	204.67	621.60	669.40
Total w. Maadi Ext.	25.74				216.38	242.63	740.32	797.66

14.5 Economic Evaluation

14.5.1 Projects Subject to the Economic Evaluation

In addition to the construction cost of Expwys 2 and 3, the cost of the following projects, which form the Expwy network together with Expwys 2 and 3, were included in the project cost for the economic evaluation, because these project links affect the benefit of Expwys 2 and 3. The economic cost for these projects are summarized in Table 14.5.1.

A. Expwy No. 1 (6 Oct. Br. extension)
B. Ring Road South Nile Br., Eastern approach to Expwy 2 Junction and Western approach beyond Zomor Canal in Giza.

Table 14.5.1 Expwy Projects Economic Cost by Component
(unit: million LE at 1987/88 domestic economic prices)

Case	Economic Construction Cost
Expwy 2	359.1
Expwy 3	310.3
Extended Expwy 1	80.0
Nile Bridge Portion	458.8
Maadi Extension	128.3

The annual maintenance cost is calculated as 0.7% of the construction cost, and the land acquisition cost (80.2 million LE) is adopted as the residual value of the project at the end of the project life.

14.5.2 Economic Appraisal

Economic evaluation indices of seven cases incorporating different combinations of the components are shown in Table 14.5.2. In all the cases, the extended portion of Expwy 1 is included, and the extended portion of Expwy 2 to Maadi is not considered in the cases.

In can be concluded from the national economic viewpoint that all the cases are economically viable and worthy of being implemented, judging by the EIRR which exceeded the Opportunity Cost of Capital of 12% in Egypt. However, it is better to postpone the implementation of the extension of Expwy 2 beyond the year 2000, because the contribution of the extension to the improvement of the investment efficiency of the whole project is relatively small in comparison with the construction cost of all the components.

The economic indices in Table 14.5.2 show that there is no significant change in EIRRs in the case where both the Nile Br. and Expwys are toll free, and in the case where Nile Br. is toll free and Expwys are toll. In the cases where Nile Br. and Expwys are toll, also there is no significant change in EIRRs of the sub-cases with Nile Br. and Expwys 2 and 3, with Nile Br. and Expwy 2, and with Expwy 3, however the sub-case with Nile Br. and Expwys 2 and 3 shows the highest NPV. The followings are the summary of the economic evaluation of Expwy Project.

A. When Nile br. is served as toll free bridge, the negative impact in terms of the national economy is small even if the toll system is introduced in Expwys.

B. When the toll system is introduced in Nile Br. and Expwys, the alternative with Nile. Br. and Expwys 2 and 3 produces the highest benefit, followed by the Nile Br. and Expwy 2 alternative.

Table 14.5.2 Summary of EIRR for Expwy Projects

Case	B/C 12%	NPV 12% (MLE)	EIRR (%)
Whole Route Free of Charge			
1. Nile br.+ Expwy 2	1.9	443.6	20.9
2. Expwy 3 only	1.8	152.1	19.4
Nile br. Free and Expwy Toll			
1. Nile br.+ Expwy 2	1.6	248.7	18.1
2. Nile br.+ Expwy 2 and 3	1.4	247.5	16.5
Whole Route Toll			
1. Nile br.+ Expwy 2	1.1	64.2	13.6
2. Nile br.+ Expwy 2 and 3	1.1	73.8	13.4
3. Expwy 3 only	1.2	33.3	13.9

14.6 Financial Evaluation

14.6.1 Requirements of Toll Road System

The main objective to introduce toll road system is to alleviate a huge amount of public investment and to establish the system that beneficiaries should contribute to cover the cost incurred by the construction and operation of roads in accordance with the benefit received. The introduction of toll road system should meet the following requirements:

A. Urgency
A shortage of capacity for the anticipated traffic demand is foreseen and the construction of the project road to mitigate this condition is considered extremely urgent.

B. Benefit
The benefit of road users on the project road should exceed tariff rates imposed on vehicles.

C. Profitability
All cost incurred from the investment and operation of the project road should be covered by the collected charges.

Among these requirements, item A was verified by the Master-plan. This section focuses on items B and C to know whether the toll road system could be financially applied in GCR. The proposed Expwys 2 and 3 were selected for the Study.

14.6.2 Evaluation Condition

1) Evaluation Alternatives

Conditions applied for the financial evaluation are summarized in Table 14.6.1. The financial evaluation was made for the following four alternatives:

a. Expwy 2
b. Expwys 2 and 3
c. Expwy 2 and Nile br.
d. Expwys 2 and 3, and Nile br.

In cases c and d, the Nile br. and its east and west approaches are included in the toll road network, and it is assumed that the same entity to operate Expwys 2 and 3 will be responsible for the construction and operation of the bridge and its approaches. While in cases a and b, Nile br. and its approaches are assumed to be constructed by public sector investment.

2) Conditions for Financing Plan

The initial investment cost is assumed to be financed by long-term loans. Short-term loans will also be required until the total annual expenses including loan repayment cost will be covered by the annual revenue. In the Study, the following financing plan is made to examine the possible effect on loan repayment.

Foreign Portion ..... 67% by Long-term Foreign Loan
Local Portion ..... 23% by Long-term Local Loan
Equity 10%

Both the loan conditions of foreign currency and of local currency were assumed as in Table 14.6.1, based on the past average procurement conditions of domestic and international loans experienced in Egypt. As for the equity, the figure was assumed on the basis of the past examples of the urban toll road systems in Japan, France and Italy.

Table 14.6.1 Summary of Financial Evaluation Conditions

Items	Applied Data				Remarks
1. Project Year					
Construction	1991-1994 (4 Years)				
Operation	1995-2015 (16 Years)				
2. Inflation Rate					
Foreign	5%				Foreign 1965-80:7.6% 1980-86:5.3%
Domestic	13%				Domestic 1965-80:7.5% 1980-86:12.4%
3. Exchange Rate					
at 1988	1 US$=2.3 LE				
Devaluation Rate	8%				
4. Construction Cost	Expwy.2	Expwy.2,3	Expwy.No.2 & Nile Br	Expwy.2,3 & Nile Br	
Foreign (M.US $)	96.8	181.3	198.8	283.3	
Domestic (M.LE)	111.2	204.7	313.4	406.9	
5. Financing Plan					
Foreign	9%, Maturity: 23 Years, Grace :10 Years				
Domestic	15%, Maturity: 15 Years, Grace: 5 Years				
Equity	10%				
					Japan: 8%, France: 10-20%, Italy: 12-13%
Repayment	Equal Payment of Principal and Interest				
Short-term	20%				
6. Tariff Rate	Raising according to inflation Rate 1995: 3 LE per ride ,2000: 5, 2005: 10				
7. Increase Rate of Traffic Volume	Expwy.2	Expwy.2,3	Expwy.No.2 & Nile Br	Expwy.2,3 & Nile Br	
1995-2000	5.3%	5.8%	5.3%	5.8%	
2000-2007	7.9%	6.6%	7.9%	6.6%	
2008-2020	0%	0%	0%	0%	
8. Salaries & Wages					
1) Monthly Salary	150 LE/staff				
2) No. of Staff					
(1) Toll Booth	Expwy.2	Expwy.2,3	Expwy.No.2 & Nile Br	Expwy.2,3 & Nile Br	
1995	84	256	116	164	
2000	112	280	152	216	
2007	145	361	206	283	
2020					
(2) Adm. Office	No.of Toll Booth* 15 %				
3) Material Cost					
(1) Toll Booth	No. of Staff Cost*1.25*1.04				
(2) Adm. Office	No. of Staff Cost*1.25, Room Rent 3000LE/month				
9. Vehicle Holding Cost					
1) Purchase	Price	No. in 1994	in 2006	in 2008	
Jeep	50000	3	3		
Sedan	27680	4		4	
Wrecker	70000	3	3		
2) Annual Running Cost/Km	Fuel & Oil	Others	Run Km		
Jeep	0.0863	0.0372	30000		
Sedan	0.0309	0.0128	21370		
Wrecker	0.1776	0.0579	40000		
10. Maintenance Cost	Initial Investment* 0.7 %				
11. Overhead Cost	(Item 8 & 9)*2, not more than Revenue*10%				
12. Loss Allowance	Tariff Revenue* 15%				

3) Demand and Tariff Rate

(1) Charge System

The toll system is classified into fixed charge system and distance related charge system. In this Study, the fixed charge system was applied because of the rather short length of toll road and because in most of the cities, the fixed toll system is applied for the urban toll roads to simplify the tariff rate.

(2) Tariff Rate

Fig. 14.6.1 shows the relationship between tariff rate of the toll road and the expected annual revenue. The traffic volume will decrease with the tariff rate increase. The total revenue from the road is calculated by multiplying the traffic volume and tariff rate. The tariff rates of 1.0 LE to 2.0 LE per ride show the highest annual revenue.

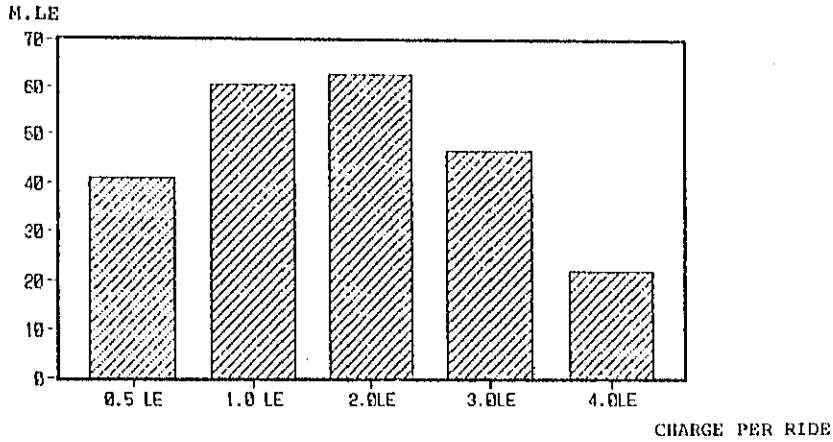


Fig. 14.6.1 Relationship between Tariff Rate and Annual Revenue

Fig. 14.6.2 shows the expected average travel speed on the toll road and the other roads by tariff rate. The difference of the two travel speeds becomes bigger when the tariff rate increases, because more traffic turns to toll free roads and the vehicles on the toll road can enjoy higher travel speed. The average travel speeds were calculated at 32.6 km/h on the toll road and 5.9 km/h on the other roads when the tariff was 1.0 LE per ride.

The average travel time was calculated at 0.225 of an hour and 1.797 hours on the toll road and the other roads respectively, applying the average travel speed and the trip distance of 10.6 km. The average time saving of a car user by the toll road was then calculated at 1.472 hours or 2.97 LE per vehicle applying the VOC of 2.021 LE/Veh/h. The road users benefit by using the toll road was calculated at approximately 3 times higher than the tariff rate.

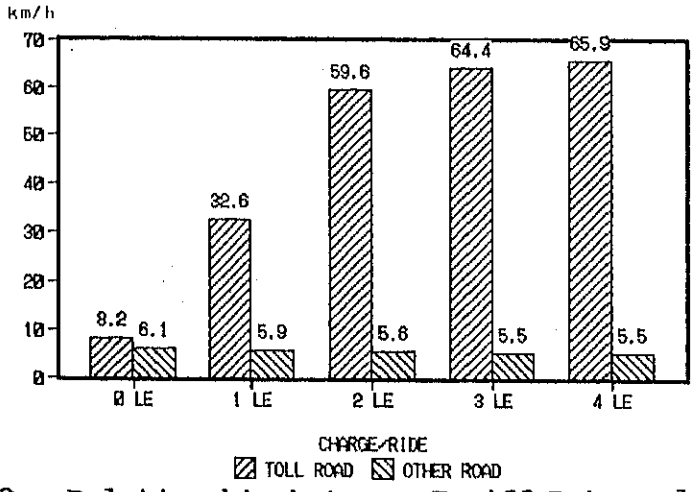


Fig. 14.6.2 Relationship between Tariff Rate and Travel Speeds

(3) Traffic Demand Increase Rate

Traffic volume was estimated to increase annually by between 5.3% and 5.8%, depending on alternative, during 1995 - 2000 and by between 6.6% and 7.9% during 2000 - 2007. This rising tendency was expected to continue to the end of the project life (2016). However, the past experience in Tokyo Metropolitan Expressway shows that the 4 lane urban highway will be saturated with the cross section traffic volume of 150,000 veh. per day. This situation is assumed to happen in the year 2007 in this Study.

(4) Tariff Rate Increase

Fig. 14.6.3 shows the inflation rate and the tariff rate. It is planned to increase the tariff rate to 3.0 LE in 1995, 5.0 LE in 2000 and 10.0 LE in 2005 in accordance with the expected inflation.

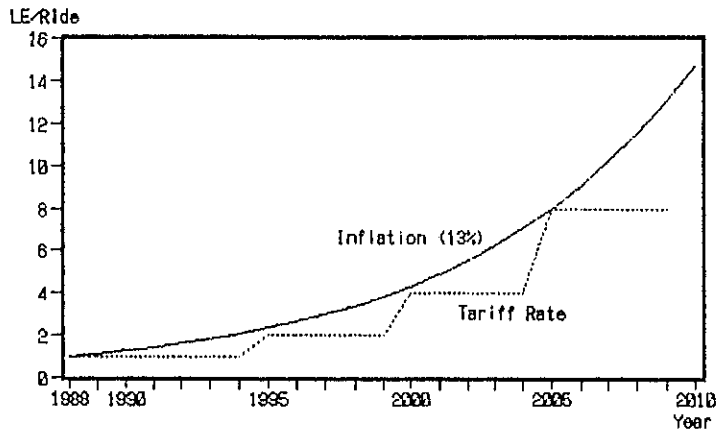


Fig. 14.6.3 Proposed Tariff Rate Increase for Expwy Projects

4) Operation and Maintenance (O & M) Cost

(1) Operation Organization

The operation organization structure is assumed as in Fig. 14.6.4. The road maintenance works and toll collection are assumed to be carried out by consigned enterprises so that the maintenance cost and the cost for toll collection can fluctuate flexibly in accordance with the traffic demand. The assumed organization will only be responsible for the management, administration and planning of the toll road system.

The total annual operating and maintenance cost is summarized in Table 14.6.1.

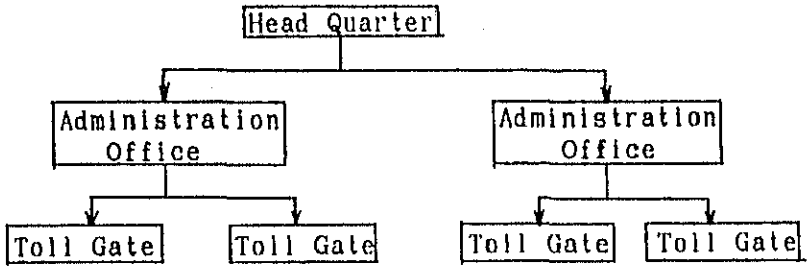


Fig. 14.6.4 Proposed Organization for Expwy Projects

(2) Cost for Toll Collection

a. Wages of Toll Collectors

The change in number of staff at the toll gates depends largely on the traffic demand. The required number of staff at a toll gate was estimated on the assumption of one provisional staff and three shifts. The required number of lanes was calculated applying the queue equation and the following factors;

- Average Daily Traffic Volume
- Average Service Time at the gate; 6 seconds per vehicles was assumed based on the experience in Japan.
- Allowable maximum waiting vehicles in a queue; one vehicle was adopted for convenience.

b. Toll Gate Operation Cost

Toll gate operation cost includes;

- Machine treatment cost
- Repair cost of booth and road

(3) Maintenance Cost

The road maintenance cost contains the following items:

- Maintenance Cost - Electricity Cost
  - Cleaning Cost
- Repair Cost
- Others

Electricity cost includes the cost of electricity for lighting and other facilities and services. Cleaning cost includes the cost of cleaning the road surface, guard rails, traffic signs, etc. Repair cost includes the cost of road surface repairs, overlays, painting of bridges, guard rails, etc., inspection of structures, expansion joint repairs and inspection and repair of electric and traffic control facilities.

Since there is insufficient data on toll road maintenance costs in Egypt, the data in the Tokyo Metropolitan Expressway is referred to establish the cost.

(4) Overhead Cost

Number of staff in the administration offices are estimated to be about 15% of the total number of toll gates staff. Material cost in the administration offices contains the following items:

a. Room rent
b. Office cost
c. Repair and maintenance cost of equipments
d. Vehicle holding cost

(5) Loss Allowance

Loss allowance account will be provided for the loss which may occur accidentally, amounting to 15% of the revenue. Fifteen percent of the revenue in the first year and thereafter 15% of the difference in revenue from the previous year are counted.

14.6.3 Evaluation Results

The evaluation indices for each alternative are shown in Table 14.6.2, and the single year and the accumulated balance is shown in Figures 14.6.5 thru 14.6.8.

FIRR in terms of constant price for all the alternatives show sufficient profitability of 7% to 12%.

It is calculated that the initial investment can be recovered in the year 2000 in the alternative where Expwy 2 without Nile br. is operated, and in the year 2010 in the alternative where Expwys 2 and 3 with Nile br. are operated. Even in the second alternative, the recovery period is 16 years after opening which implies high financial viability comparing with the recovery period of other toll road cases in the world of 20 to 30 years.

Table 14.6.2 Financial Evaluation Results for Expwy Projects

	Description		without Nile Br.		with Nile Br.	
			Expwy 2	Expwy 2 & 3	Expwy 2	Expwy 2 & 3
1	Initial Investment	MLE	333.9	621.6	770.7	1058.4
2	AADT IN 2000	1,000 Veh/d	168	226	192	235
3	FIRR					
1	at Constant Price	(%)	13.0	4.1	5.8	1.7
2	at Current Price	(%)	21.4	16.4	13.9	12.7
4	Investment Recovery Year					
1	Net Surplus	Year	1995	1995	1995	1995
	years after opening	Year	1	1	1	1
2	Ending of Balance	Year	1998	2002	2003	2008
	years after opening	Year	4	8	9	14
5	Max. Single Year	MLE	58.9	108.8	134.4	184.4
	deficit (current)	Year	1994	1994	1994	1994
6	Max. Accum. Deficit					
1	at Constant Price	MLE	68.0	126.4	136.4	214.7
		Year	1994	1994	1994	1994
2	at Current Price	MLE	141.6	263.2	328.1	817.4
		Year	1994	1994	1999	2004
3	Ratio to Initial Investment	(%)	20.3	20.3	20.3	20.3
6	Break-even point on 2% interest	1,000 veh/d	46	74	75	103

Note: AADT at Toll Gates

The maximum accumulated deficits in the constant price base are calculated at about half to 1/3rd the initial investment for all the alternatives.

The financial profitability of Expwys largely depends on the existence of the Nile br., therefore the cases where the same entity will construct and operate the bridge and its approaches are recommended from the standpoints of alleviation of the burden on the public sector investment, and that the financial profitability is proved.

The construction of Expwy 3 reduces the financial profitability of the toll road system, therefore stepped construction, implementing Expwy 2 and Nile br. in the first stage and Expwy 3 in the second stage is recommended. The stepped construction and the opening of the toll road can provide the opportunity to examine the relationship between tariff rate and traffic demand and car users behavior on the toll road in GCR before investing the total amount.

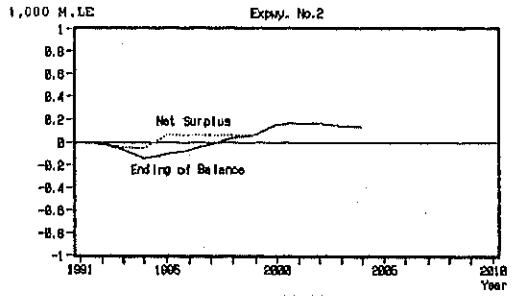


Fig. 14.6.5 Evolution of Accumulated Balance (Expwy 2 Case)

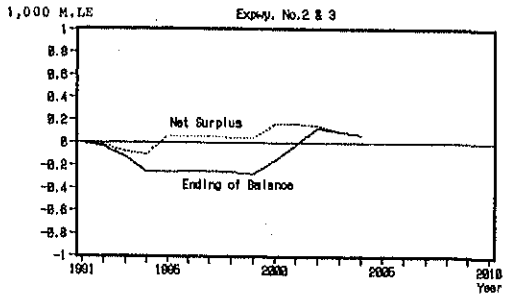


Fig. 14.6.6 Evolution of Accumulated Balance (Expwys 2 & 3 Case)

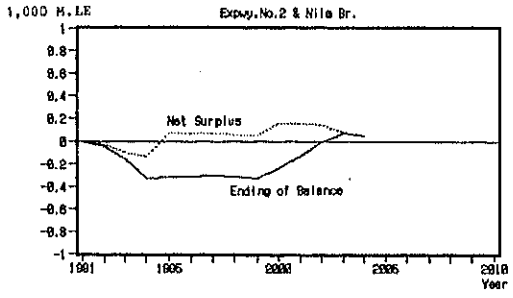


Fig. 14.6.7 Evolution of Accumulated Balance (Expwy 2 & Nile Br. Case)

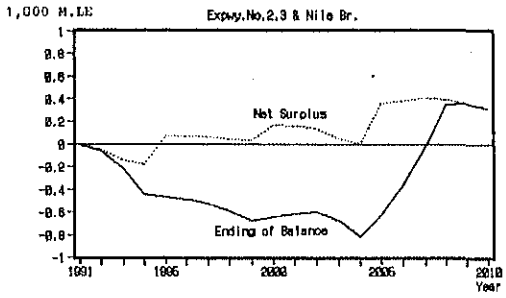


Fig. 14.6.8 Evolution of Accumulated Balance (Expwys 2, 3, & Nile Br. Case)

14.7 Recommendation

From the viewpoint of high EIRR and relief of traffic congestion, it is advisable that these projects be implemented as soon as possible and at the same time. However, the high total construction cost amount of 1,133 million LE in 1988 price makes it difficult to implement all five components of the project at the same time. Therefore the five components will be divided into the following two parts to overcome this difficulty and improve the efficiency of other on-going projects related to them, ie. extension of Expwy 1 and Nile bridge.

First Stage : Construction in the first half of the 1990's with operation to commence in the second half for Expwy 2 and Nile br. including Ring Road southern section from Expwy 2 to Giza.

Second Stage : Construction in second half of the 1990's with operation to commence in 2000 for Expwy 3 and connection between Expwy 3 and Expwy 1.

Even though EIRR will be decreased by 3% by the introduction of toll system in the Expwys and the Nile br., the economic viability is still evident from the viewpoint of the total project. It is advisable to introduce toll charge system in the Expwys because of easier fund procurement to recover the construction cost and also to place the burden on the beneficiaries.

The law No. 146 of 1984 regulates the tariff rate on toll roads in Egypt disregarding the road users benefit or price escalation by inflation and Ministry of Transport is the only entity responsible for toll roads. Prior to the commencement of the project, the tariff rate in the law should be reviewed to a reasonable level.

It is also recommended to establish the entity responsible for urban toll roads. This entity should be semi-government and semi-private so that a part of public investment fund and long-term foreign loan can be introduced at the beginning of the project. At the same time the entity can be operated as a private sector entity.